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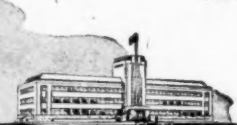

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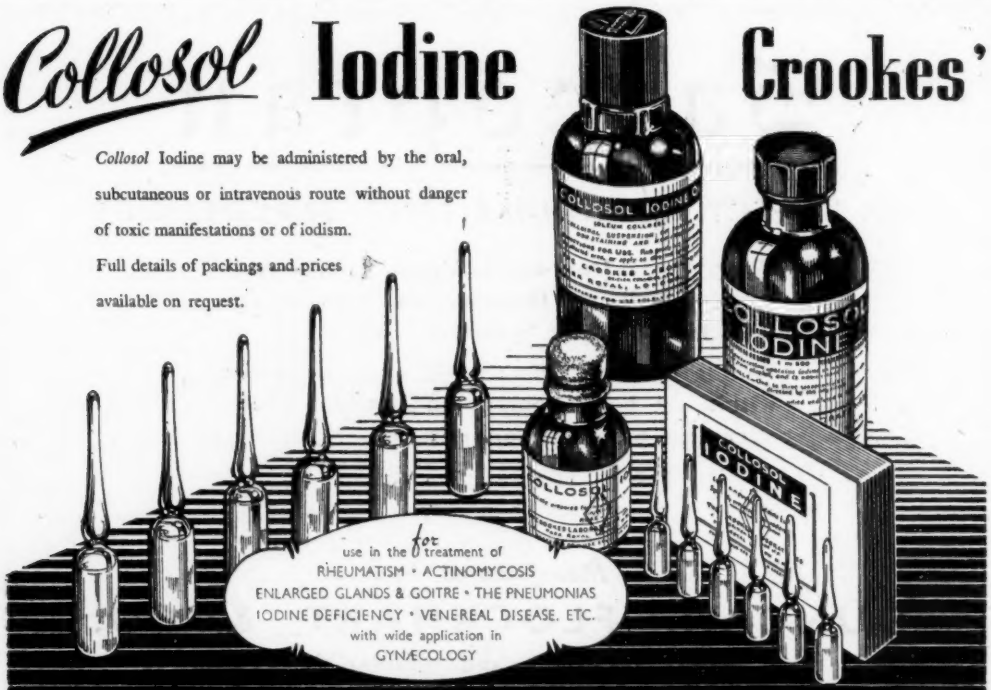

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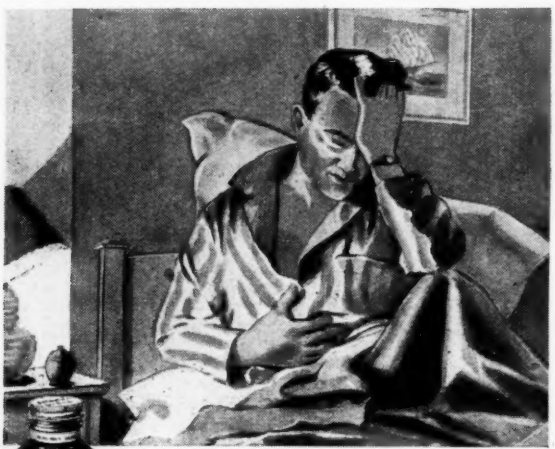

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BERNHARD BARON RESEARCH PROFESSOR AT THE ROYAL COLLEGE OF SURGEONS OF ENGLAND

Two and a half years ago, the first samples of citrated plasma for transfusion arrived with the BEF in France. They had been prepared by Whitby and his colleagues who had developed a successful technique for the production of plasma in bulk, and whose pioneer work was largely responsible for the adoption of plasma-transfusions as a routine in the treatment of casualties.

After severe hæmorrhage or extensive trauma, one of the most important principles in treatment is to restore the blood-volume. Isotonic fluids containing no plasma proteins produce but transient beneficial effects, while plasma-transfusions raise and sustain the blood-volume. Responses to plasma-transfusions, however, are unfortunately variable, even when clinical or experimental conditions are apparently identical. Observations of changes in hæmoglobin and plasma-protein concentrations show that such changes are due to at least five factors: (1) the simple mixing of transfused plasma with the circulating blood; (2) the formation of a surface film of plasma on the walls of the expanded vascular bed; (3) the establishment of colloidal osmotic equilibrium between the plasma of the axial stream and that of the peripheral film of plasma; (4) the migration of fluid either into or out of the blood; (5) the translocation of plasma protein from or into the blood. It is by the interplay of these factors that the hæmoglobin and plasma-protein concentrations and the total blood-volume are finally determined.

* * *

In man it has been shown (Ebert and Stead 1941) that there is no evidence of a store of red cells which can be discharged into the blood-stream to increase the total amount of circulating hæmoglobin. Consequently changes in hæmoglobin concentration are due (in man) to variations in the quantity of circulating plasma. It is important to realise at once that blood samples give an indication of the proportion of hæmoglobin in the *actively circulating* blood, for this does not constitute the whole of the blood-volume. Plasma exists in the blood-stream as two components, one acting as a fluid matrix for the cellular elements and the other forming a fluid lining for the blood-vessels. In a normal person, about 79% of the total plasma-volume behaves as the cell matrix, the remaining 21% as the peripheral film on the vessels. Since the thickness of the film increases as the velocity of the axial blood-stream diminishes, the greatest thickness is to be found in the capillaries. These vessels possess by far the greater part of the surface area of the whole vascular bed, so that the greater part of the peripheral film component of the plasma-volume is to be found in the capillaries (Hahn et al. 1942).

When plasma is added to the blood-stream it mixes with the axial blood, and simultaneously the vascular bed expands to accommodate the increased blood-volume. If this expansion is effected by an increase in the diameter of the existing vessels, the amount of plasma required to form a film over the increased surface area would be small relative to the increase in volume, and hence the fall in hæmoglobin concentration would be maximal. If however the expansion is effected more by the opening up of capillaries previously closed, then provided no fluid moves out of the blood-stream, much of the added plasma would form a surface film on these "new" capillaries. The amount of plasma available for dilution of the axial blood-stream would thus be reduced, and the fall in hæmoglobin concentration would be minimal.

Differing methods of expanding the vascular bed, then, may account for some of the discrepancies between the expected and observed values for hæmoglobin concentrations after plasma-transfusion; but another factor may be operating. Fluid shifts into and out of the blood-stream rapidly in cats and less rapidly in dogs and human subjects. If much fluid shifts out of the blood-stream after a plasma-transfusion, the fall in hæmoglobin concentration due to the transfusion is much less than that expected. Sharpey-Schafer and Wallace (1942) showed that the injection of large quantities (up to 1700 c.cm.) of normal serum produced in some normal subjects only a small and transient fall in hæmoglobin concentration (within 40 minutes). If these subjects responded to an increased blood-volume by opening up "new" capillaries, the speed with which fluid could leave the circulation would be increased, because of the increased surface area of capillary wall available for fluid to leave the blood-stream. Other subjects in the series showed falls in hæmoglobin concentration of the order of 20%, and required days to regain their pretransfusion level of hæmoglobin—and presumably their normal blood-volume. If these accommodated a large part of the transfused serum in their larger vessels—presumably veins—the loss of excess fluid would be much slower than in the first group.

If it be assumed that no red cells are added to the circulation during the period of observation—and in man this assumption is almost certainly true—then the ratio of hæmoglobin after transfusion to that before transfusion would be equal to the ratio of the blood-volume before transfusion to the blood-volume before transfusion plus the fluid transfused, provided that all the fluid transfused remained in the circulation and that all of this fluid was used to dilute the circulating blood. Since it appears certain that fluid leaves the circulation, and also that some part of the transfused plasma is required to form a surface film on the expanded vascular bed, then, if these two ratios are equated, the greater the loss of fluid from the circulation or the greater the proportion of the transfused fluid immobilised as a surface film, the greater will be the calculated blood-volume.

Hayward (1942) transfused with known quantities of serum 8 subjects all suffering from peripheral vascular disease of a sclerotic type. He observed the fall in hæmoglobin concentration immediately after the end of transfusion. When blood-volumes are calculated from these figures, 4 out of the 8 subjects showed values in excess of the normal value. These high values were: 10·29, 7·35, 6·8, and 5·7 litres. As the time taken to give the transfusions of 800 c.cm. varied between 1 and 3 hours (at the rate of 5–15 c.cm. per min.), fluid loss from the circulation must have been considerable, although Hayward stated that "after an initial increase equal to the amount of serum injected, the blood-volume gradually returns to normal over a period of from 2 to 3 days. . . ." Since these subjects had abnormal vessels, it is not improbable that the immobilisation of some of the transfused serum on the walls of opened-up capillaries might account partly for the small fall in hæmoglobin concentration.

These results were obtained in subjects who had not suffered any loss of blood. Kekwick and his colleagues (1941) made a study of the effects of plasma-transfusions on subjects who had been injured in air-raids. In one of their cases a loss of 1600 c.cm. of blood had been estimated. After transfusion of 2 pints (1126 c.cm.) of citrated plasma, the hæmoglobin concentration fell from 110% to 85%. If it be assumed that all the plasma transfused mixed with the axial blood-stream and that none was lost as a surface film or from the circulation, the calculated blood-volume of this patient would have been 3829 c.cm. before transfusion. This is not an unreasonable figure and would suggest that either little fluid had left the blood-stream or little plasma had been used to form new surface films, or both these had occurred simultaneously. If however—as is almost certain—some fluid had left the blood-stream during the transfusion, it would not be unreasonable to assume that the loss would not exceed the volume (300 c.cm.) of diluting citrate solution added to the plasma. The volume of fluid left to dilute the axial stream would be about 825 c.cm. The blood-volume calculated on this basis before transfusion would have been 2805 c.cm., or a difference from the previous calculation of 1 litre.

Again some of the transfused plasma must have been used to form a surface film on the expanded blood-vessels. This would still further reduce the calculated blood-volume, but by what amount cannot be estimated. Kekwick's estimate of the loss of blood in this patient was probably conservative and a loss of 2 litres would have been more likely.

* Based on two Bernhard Baron lectures given at the Royal College of Surgeons of England on June 2 and 10, 1942.

Assuming that after the hæmorrhage but before transfusion the blood-volume was 3 litres, and that the increase in blood-volume after 2 pints of plasma was about 825 c.cm., the approximate blood-volume before a third pint of plasma was given would be 3825 c.cm. The hæmoglobin concentration fell from 85% to 80% after the transfusion of the third pint. This would give a calculated blood-volume of 9008 c.cm., assuming that there was no fluid loss and all the plasma transfused diluted the axial stream. Obviously, therefore, a considerable proportion of this third pint was lost from the axial stream either by being immobilised as a surface film on expanded vessels or by leaving the circulation. If we assume that the actual blood-volume was 3825 c.cm. before the third pint of plasma was given, only 239 c.cm. of fluid would be required to provide the necessary blood dilution. Thus, of this third pint (563 c.cm.), about 324 c.cm. was "lost." Since the plasma equivalent of this pint was about 413 c.cm., only 150 c.cm. of this loss could be accounted for by the removal of the protein-free diluting fluid from the blood-stream. It is therefore clear that after hæmorrhage considerable fluid loss from the circulation can take place, even when the blood-volume is still below the normal level, and at the same time there is a considerable opening up of closed capillaries.

These deductions are at best indirect evidence that the capillary field opens up when the blood-volume is increased. Since they are based on observed values which are themselves liable to considerable error (± 2% for hæmoglobin determinations), the calculated values for blood-volumes would be valueless were it not for the fact that three different observers have noted in man considerable discrepancies between the observed and expected values for hæmoglobin concentrations, and moreover these discrepancies were of the same sign: the observed values were higher than the expected ones. The same discrepancies have been noted in anæsthetised animals (Beattie 1942).

When plasma or serum is transfused into normal human subjects or experimental animals, the pre-transfusion blood-volume is restored, rapidly in some subjects, less rapidly in others. Again, transfusion of plasma, with normal plasma-protein concentration, into human subjects or animals which have suffered severe hæmorrhage does not necessarily restore the blood-volume to the normal value, even when the quantity of plasma transfused is equal to or considerably exceeds the total volume of blood lost. Our knowledge of the mechanisms involved in the control of blood-volume within normal limits are as yet incomplete.

* * *

The plasma-protein concentration in the axial stream after a transfusion is determined by many factors. If a rapid transfusion is given of plasma containing a concentration of plasma protein considerably less than that of the animal's own plasma, many animals show, about 10 min. after the end of transfusion, a concentration of plasma protein in the axial stream much in excess of their plasma before transfusion. This sudden excess of plasma protein cannot be accounted for by a sudden outflow of fluid from the blood-stream. It seems, on the contrary, that it is due to an actual flow of plasma proteins into the circulating blood-plasma (Beattie and Collard 1942b). The stimulus to this outflow of plasma protein may be the low plasma-protein concentration in the transfused plasma; but if this is the adequate stimulus; it is not adequate in every animal; some other factor must be involved.

After this preliminary rise in protein concentration in the plasma, there is a decline during the first 30 min., which may be due to diffusion into the peripheral plasma film of some of the protein tending to bring this film into osmotic equilibrium with the plasma in the axial stream. Such a fall may be due also to an active removal of plasma proteins from the blood. Since the fall takes place without any evidence of a change in plasma-volume or hæmoglobin concentration, it is apparently not due to an outward movement of fluid from the blood.

There is now ample evidence that plasma proteins can enter the blood rapidly after hæmorrhage, to maintain a constant plasma-protein concentration in spite of the entry of fluid into the blood-stream (Wallace and Sharpey-Schafer 1941). Likewise, it has been shown in normal human subjects that the introduction of large quantities of plasma or serum into the circulation may be followed by little or no significant change either in hæmoglobin or plasma-protein concentration (Sharpey-Schafer and Wallace 1942). This can only be interpreted as a simultaneous movement of fluid and plasma protein from the circulation. Similar observations have been made in experimental animals (Beattie 1942, Beattie and Collard 1942a). In man the rate of this inflow of protein to the blood may be estimated from 2 subjects included in Wallace and Sharpey-Schafer's data (1941).

Subject 19 was bled 750 c.cm. of blood; 4 hours later he reached his state of maximum hæmoglobin dilution, which may be regarded as the attainment of a prehæmorrhage blood-volume. The plasma-protein concentration at this time was 6·9 g. per 100 c.cm.; hence the total plasma protein added was at least 51·75 g., or a rate of addition equal to about 13 g. per hour. Assuming a body-weight of 65 kg., this would be an addition of 0·2 g. per kg. of body-weight per hour. In this subject it was determined directly that the blood-volume had been fully restored at the time of maximum dilution. Subject 21 was bled 720 c.cm.; 19 hours later he reached maximum dilution and his blood-volume then had increased from 5·3 l. before hæmorrhage to 6·6 l. after hæmorrhage. The plasma-protein concentration before hæmorrhage was 7·8 g. per 100 c.cm., and at maximum dilution it was 6·8 g. per 100 c.cm. The total plasma protein in circulation before hæmorrhage was 413·4 g.; at maximum dilution it was 448·8 g., representing a gain of 35·4 g. But all the plasma proteins lost by hæmorrhage were also replaced. The quantity of plasma protein lost may be estimated at 54 g. (taking the average concentration of the plasma as 7·5 g. per 100 c.cm.). The total replacement in this subject was, therefore, about 89 g., distributed over 19 hours, or 4·7 g. per hour. With a body-weight of 65 kg., the rate of replacement would be approximately 0·07 g. per kg. of body-weight per hour. The rate of replacement is probably not uniform, and these estimates may not represent with any accuracy the rate during the early phases of replacement.

The rate of removal of plasma proteins may be estimated in 2 subjects included in the series of Sharpey-Schafer and Wallace (1942).

These showed no change in hæmoglobin concentration when one, subject 1, received a transfusion of 1000 c.cm. of normal serum over a period of 13 min., and the other, subject 14, received 300 c.cm. of serum concentrated to four times normal strength. In subject 1 no values are given for the plasma-protein concentration but it can be assumed from other statements in the article that he showed no significant change in plasma protein after the injection. Since the range of plasma-protein concentrations for the serum injection was from 6 to 8 g. per 100 c.cm., the total amount of protein leaving the blood-stream was of the order of 60–80 g. in 13 min., or 4·6–6·1 g. per min. (a rate of 276–366 g. per hour). Subject 14 removed somewhere between 76·8 and 100·2 g. of protein within 12 min. The small rise in concentration recorded (7·2 to 7·3 g. per 100 c.cm.) is probably of no significance. The rate of removal in this subject was of the order of 6·4–8·4 g. per min., or 384–504 g. per hour.

There is abundant evidence that the removal of such quantities of plasma protein from the circulation, whether in human subjects or animals, is not accompanied by any significant increase in nitrogen output. The conclusion that the protein is removed into a store or stores of some kind seems the probable explanation; Whipple (1940) has provided evidence that such storehouses do exist in animals. When considerable quantities of plasma-protein are given by repeated transfusions to animals (Beattie and Collard 1942b), at first there is a tendency for the plasma-protein concentration, after some variation within 30 min. of the transfusion, to become stabilised at or about the pretransfusion level. With further transfusions, eventually a stage is reached when the plasma-protein concentration is elevated and remains elevated for some hours. This may be regarded as a sign that the storehouses have been filled and that excess plasma proteins can only be retained by expanding the blood-volume or increasing the plasma-protein concentration, or by both measures.

It has been suggested that the liver is an important, if not the most important, storehouse. Taking the rate of removal in man to be of the order of 7·5 g. per min. and the average weight of the liver to be 1500 g., the liver would require to store protein at the rate of 0·5 g. of

protein per 100 g. of liver per min. Since the rate of blood-flow in the liver is about 150 c.cm. per min., this would mean a removal of 0·3 g. of protein from every 100 c.cm. of blood, or from about 50 c.cm. of plasma per min. over a period of 12–13 min. This rate of removal seems too high to be within the capacity of the liver alone.

There is evidence that protein can be removed from the circulation by hepatectomised animals in quantities which suggest that stores exist elsewhere than in the liver, but these results cannot yet be compared directly with the human data of Sharpey-Schafer and Wallace (Beattie and Collard 1942b). The site of these alternative stores has not been determined. It may well be that each living cell can act as a protein store. If we accept Whipple's hypothesis (1940) that the plasma proteins and the dispensable proteins of the body cells form parts of a single protein system in dynamic equilibrium, then we can visualise the plasma proteins as being one reservoir and the dispensable proteins of the body cells as another. Using this reservoir analogy, a fall in plasma proteins in the blood would tend to be compensated for by a flow of protein into the blood, as happens after hæmorrhage. When plasma-protein concentration increases as fluid leaves the blood-stream, protein moves out of the blood into the stores until equilibrium is established. This process could continue until the capacity of the body cells to hold excess protein was exhausted. Rises in plasma-protein concentration after repeated plasma or serum transfusions may thus be the first sign of protein intoxication. Though the liver is probably not the only storehouse of protein, it is undoubtedly the site of manufacture of plasma protein. Plasma protein is not only in a sense a store of protein, it is also the gold standard of protein exchange—an essential part of Whipple's dynamic equilibrium of protein.

The increase in protein reserves which plasma-transfusions bring about may be almost as important as the increase in blood-volume which follow them. The drain on these reserves in severe infections and after extensive burns is obviously great; to support them may be as valuable as to combat bacterial invasion by sulphonamides. In shock, for some reason as yet unknown, the rate of plasma-protein replacement is slow but as the plasma-volume is increased the rate of replacement also increases (Ebert et al. 1942).

This is not the place to discuss how the dispensable proteins of the liver or body cells are mobilised and transferred so rapidly to the blood, or how plasma proteins can leave the blood-stream even more rapidly. Movement of fluid into the blood-stream takes place at rates, in man, of the order of 200 c.cm. per hour. At the same time plasma proteins can enter at rates of about 15 g. per hour. Such rates of movement are but average rates, and soon after hæmorrhage may conceivably be much higher. On the other hand, after transfusion fluid may leave the blood-stream at rates of 100 c.cm. per *minute* and plasma proteins at rates of 4–6 g. per min. It is by no means clear how these massive movements are effected without ill results.

This study of the fate of plasma-transfusions shows clearly that we have yet much to learn of the mechanisms involved in the control of plasma-volume and mass movements of plasma protein. A more complete understanding of these may enable us to answer the question "What do we mean by shock?" and to treat more effectively the conditions included under that name.

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PERIPHERAL VASONEUROPATHY AFTER CHILLING

"IMMERSION FOOT AND IMMERSION HAND" *

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Note on the MORBID ANATOMY
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IMMERSION foot, as seen in this war in men who have been exposed in rafts and open boats with their legs immersed in cold sea water, closely resembles the condition called trench foot in the last war. The hands may be similarly affected. The following account is based on upwards of 80 cases seen in Scotland in the last 2½ years.

CLINICAL FEATURES

During exposure, which lasted for periods up to 14 days, the immersed limbs soon became numb; the hands felt clumsy, and some patients described walking "as if on cotton-wool." Pain, tingling and even itching were unusual; cramps sometimes occurred, usually in the calves. Swelling of bare feet was noticed after some hours or days; or otherwise not until the boots felt tight. The skin, red at first, was later pale, "sickly yellow," mottled, blue or black; at sea-freezing temperatures it might remain vivid red. The symptoms and signs observed in the affected limbs after rescue may be described in three stages.

1. *The prehyperæmic stage* lasts from a few hours to several days. The extremities remain cold, somewhat swollen, discoloured and numb, with fairly extensive glove or sock anæsthesia. Peripheral arteries may be pulseless for some hours, and remain so in cases going on to gangrene.

2. *A hyperæmic stage* follows, and may last 6–10 weeks. Typical findings in this stage are:

(*a*) *Vascular disturbances.*—The skin of affected parts remains hot and red at a temperature of 30–34° C., even when the unclothed body is exposed in a cool room; the usual temperature gradients are absent, digits being as hot or hotter than the groins or axillæ. The affected parts, red with a slight bluish tint, become congested on hanging down to a deep purplish red and blanch rapidly when elevated. Blanching from finger pressure disappears quickly except in parts destined to become gangrenous. Such parts are not warm like the rest of the limb; a line of demarcation forms later.

(*b*) *Swelling* often increases, especially if the extremities have been warmed; it pits on pressure, except in the digits or where there are hæmorrhages. With rest it subsides within 3 or 4 weeks.

(*c*) *Sensory disturbances.*—Tingling (pins and needles) is felt early, may increase at 7–10 days, and often lasts 6 weeks; of glove or sock distribution, it is increased by hanging or warmth. Affected parts ache or throb; shooting pains, often delayed until 7–10 days, occur as sharp stabs, frequently several at a time, at irregular intervals. Worse at night and often calling for morphia, the pains are made worse by warmth; they sometimes begin after the first hot bath. The feet may be thrust outside the bedclothes. Pains tend to be more noticeable when the feet are dependent, during and after exercise, after exposure to cold, sometimes during micturition and defæcation, and occasionally with coughing or yawning.

Sensory loss may have shrunk, but retains its glove, sock or slipper distribution; upper levels are often ill-defined. Anæsthesia tends to be more extensive on palmar and plantar than on dorsal surfaces. Loss of sensation to moderate pin-prick is usually more extensive than loss to cotton-wool. Delayed responses to pin-prick are common in areas of partial sensory loss. In the hot limbs sensory loss to heat at 40–50° C. is more extensive than to cold at 12° C. Deep-pressure sense may be absent. In the great toes vibration sense is often absent, joint position sense usually retained. Several varieties of hyperæsthesia (or "hyperpathia") are found—tingling (e.g., in the digits, elicited or increased by pressure); painful over-reaction to light handling or stroking, often in areas insensitive to touch, pin-prick or even deep pressure; excessive but perhaps delayed responses to pin-prick, causing

* Based on a lecture given on June 3, 1942, in the "War Medicine Series" at the British Postgraduate Medical School.

withdrawal of the foot, in otherwise hypoalgesic areas; muscle tenderness; and tenderness accompanying inflammation (e.g., infected blisters).

(*d*) *Motor disturbances.*—Muscles whose points of nerve entry lie within the cooled territory may show weakness, and later wasting and impaired electrical responses, sometimes as severe as in progressive muscular atrophy. Recovery is slow (see fig. 1). Knee-jerks are normal, ankle-jerks† nearly always obtainable, plantar reflexes absent or flexor.

(*e*) *Absence of sweating.*—Tests by the method of Guttmann (1940) showed anhidrosis approximately coinciding in extent with sensory loss (fig. 2). During recovery, sweating returns rather more quickly than sensation to light touch and moderate pin-prick.

(*f*) *Blisters, ulcers and gangrene.*—Many mild and a few moderately severe cases do not show blisters. Blisters may appear during the first 3 days after rescue, or not until the 8th to 10th day (fig. 3). Healing often takes 3–6 weeks, occasionally 3–5 months. Parts which are to become gangrenous blister extensively. The affected skin, often thick and hard, later peels extensively. Hairs may be lost, toe-nails shed painlessly. Parts of the skin are blackened and flake off leaving pink dermis, or perhaps small ulcers. Gangrene, if present, is nearly always superficial; even if the whole foot is black, tissue loss may be confined to the tips of the toes, which are shed like thimbles. In one severe case, distal parts of the feet separated at 7 weeks; pain persisted and the legs were ultimately amputated.

Other clinical findings were: occasional transient albuminuria after rescue; loss of weight, gradually regained; mild tachycardia; pyrexia up to 99·5° F., sometimes for several weeks; and minor variations in the leucocyte picture. Respiratory infections and alimentary disorders were rare.

3. The *posthyperæmic stage* lasts for weeks or months after the hyperæmia has subsided. Except for fresh blisters or infections, the extremities are no longer unduly hot in a normal environment. Indeed for months or years after rescue there may be a cold-sensitive state, giving rise to the Raynaud phenomenon, or to coldness which may last for hours after return from a cold to a warm environment. Swelling of the feet may recur when walking is resumed. Tingling and pains have usually ceased and sensation is slowly returning. Over-reaction to pin-prick is common, especially in the sole. There is gradual improvement in power and electrical reactions, and disappearance of wasting (fig. 1). After 6–10 weeks there are often complaints of excess sweating, or of sweat rashes; on a hot day socks are quickly soaked, but extremities may sweat heavily even when cold. Local faradism and painful stimuli—e.g., pinprick in "hyperæsthetic" areas—cause well-marked sweating of similar distribution, in or adjacent to areas previously anhidrotic (cf. Guttmann 1940). Blisters may recur after the patient returns to normal footwear and long walks.

Fig. 2.—Distribution of sensory loss and of anhidrosis in another moderately severe case, in the hyperæmic stage. Dotted line and crosses mark the upper levels for sensory loss to light touch of cotton-wool and to moderate pin-prick respectively. Black areas indicate heavy sweating, dotted areas moderate sweating, and unshaded areas absence of sweating (sweat test by chinizarin method, Guttmann 1940). In the right great toe the black area indicates the site of superficial gangrene.

COURSE, PROGNOSIS AND SEQUELÆ

The mildest cases in our series had swelling, tingling, pains and sensory loss, recovering completely in 2–5 weeks; few of them were observed during their whole course, but some reported transient warmth and redness of the feet. Most other cases passed through prehyperæmic, hyperæmic and posthyperæmic stages, recovering more or less completely between 3 and 12 months after exposure; many showed late sequels during the second year.

Findings shortly after rescue gave little indication of ultimate progress. Swelling, heat and redness, tingling and pains were of no prognostic value. If paralysis and extensive sensory loss persisted into the third week, recovery took many months. Blisters and gangrene have been discussed; amputation, even of toes, was rarely necessary.

Follow-up for two years in 18 moderately severe cases showed that 7 were doing full duty, 2 had been invalided, and the rest were doing light duty such as office work. Sequels, mostly transient and related to prolonged standing or walking in cold or wet weather, included tingling, usually slight (in 7 cases), aching or stabbing pains, often slight (in 15 cases), and swelling of feet (in 8 cases). A few had fresh blisters. A foot originally damaged to the extent of superficial gangrene occasionally developed "trophic" ulcers and bone and joint changes in the digits (sequestra, hammer toes), with circulatory defects suggestive of vascular occlusion. Typical intermittent claudication was not encountered. A cold-sensitive state and troublesome hyperhidrosis sometimes persisted for 2 years after rescue.

Fig. 3.—Site of blisters, healed at 3 weeks, in a case of immersion foot.

CAUSATION, INCIDENCE AND PREDISPOSING FACTORS

The essential cause of these disturbances is exposure of the limbs to cold insufficient to freeze the tissues; probably sea temperatures ranged from −1·9° C. to 10° C. Sea water freezes at −1·9° C., and tissues do not freeze until their temperature falls to −2·5° C. or less, so that parts immersed cannot be frost-bitten. Immersion has no specific action apart from its effect in keeping the parts cold. Sometimes the hands, although not immersed, are damaged as much as immersed feet. An exactly similar condition, with muscle wasting, sensory loss, excess sweating and a cold-sensitive state, affected the ungloved hand of an airman who had lain exposed for 22 hours on a snow-covered mountain. The term "immersion foot" is therefore inaccurate as well as inadequate. The ideal term should be applicable to other tissues as well as to the feet and should express both the causative factor—cold—and the neural and vascular disturbances which result therefrom—i.e., a peripheral vasoneuropathy after chilling.

Judging from the patients' histories, the following factors appear to influence the occurrence and severity of this vasoneuropathy.

1. *Time of exposure and temperature of water.*—With sea-water temperatures of 5–8° C., periods as short as 22 hours, and in one instance 14 hours, were sufficient to cause nerve damage.‡

2. *Footwear* afforded some protection during short exposure; immersed 14 hours at 5° C., an airman's left foot, covered by four socks, was less affected than the right, which had one sock. During long exposure, however, boots constricted the swelling feet and impaired their circulation; a booted foot often suffers more than one from which the boot is lost. Rubber sea-boots filled with water or sweat.

3. *Immobility.*—Men who kept moving suffered less than those who sat still. Mechanical interference with circulation accentuated the condition. A man whose left knee was damaged sat with his left leg straight, keeping the right leg doubled under him; immersion foot was more severe on the right side. An airman exposed for 14 hours in a rubber dinghy, holding tight to the centre rope, had more severe nerve damage in the hands than in the feet, which were also immersed in water.

4. *Body cooling*, as from wind, total immersion, repeated soakings or inadequate clothing, reduces the peripheral circulation.

† The possibility of these being absent in the prehyperæmic stage is not excluded.

‡ In cold so severe that sea water partly froze, even 20 minutes immersion was followed, in 2 instances, by swelling, blisters and neural lesions; parts affected were not constantly immersed, however, and were exposed to air long enough for actual freezing (frost-bite) to have taken place.

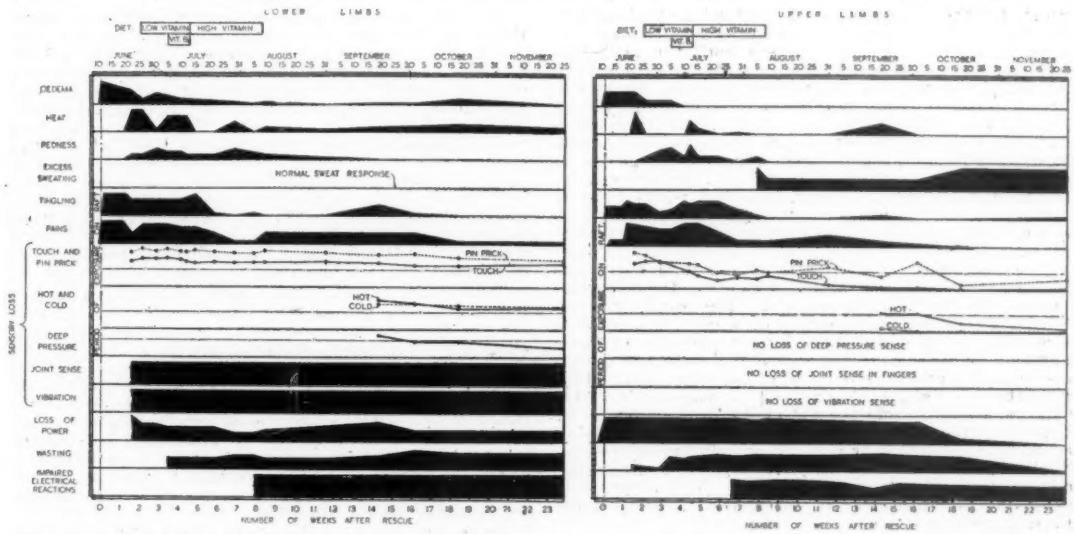

Fig. 1.—Progress charts in a rather severe case of immersion foot and hand. For sensory tests the extremities were divided into numerous small areas; total number of areas affected was charted. Progress was not influenced by the administration of vitamin B_1 or other vitamins during the periods indicated.

5. *Seasickness and starvation* may be contributory.

6. *Age.*—Men over 40 and under 17 died from cold sooner than those of intermediate age. Within the latter group, which included most cases, age and severity were not closely correlated.

7. *Race.*—Coloured races are said to be more prone to trench foot than northern races. In this study, Arabs fared no worse than Europeans.

8. *Morale.*—Those who give up hope die more quickly, or suffer more severely, than their companions.

9. *Treatment on rescue.*—(See under pathogenesis).

There was no evidence that previous susceptibility to cold feet or chilblains predisposed to immersion foot.

ALLIED CONDITIONS

Frost-bite, due to actual freezing of tissues, was seen in only 3 cases in this series. After chopping ice from the deck for 4 hours, a seaman developed gangrene in the ends of the fingers of the ungloved hand which held the axe. A man, exposed for 3½ days at sea-freezing temperatures, suffered gangrene of the fingers holding a bailer; another in the same boat developed gangrene of the skin on which he knelt to bail. These frost-bite lesions presented an interesting contrast to those of immersion foot and hand. Gangrene involved the whole thickness of affected digits; and although parts just proximal to the gangrene were hyperæmic, they were not unresponsive to vasomotor control, and not insensitive to touch or pin-prick. The area of sensory loss and anhidrosis over the front of the knees in the third case was only slightly more extensive than the scars which resulted from the gangrene. In this, and in the second case, frost-bite and immersion foot coexisted, heightening the contrast between them; the feet, immersed and therefore protected from frost-bite, showed the typical vasoneuropathy of immersion foot, and no gangrene apart from superficial necrosis of a toe (fig. 2).

Œdema of the feet, sometimes lasting several months, was seen in men who spent long periods in open boats with insufficient food or drink, in strong sunlight, with their legs immersed in warm sea water (18–20° C.). The neural and vascular features of immersion foot which are directly due to cold were absent.

MORBID ANATOMY

The material available consisted of biopsies from the interdigital nerves of the foot 2½ and 4 months after exposure, and of lower limbs, in which gangrene and sepsis had been present, amputated 4 and 11 months after rescue. The interdigital nerves showed almost complete wallerian degeneration and no significant vascular change. The tissues of amputated limbs showed a persisting œdema. The main nerve trunks showed severe degeneration and early regeneration; in the larger arteries there was slight intimal and medial fibrosis; in the large veins (1 case) patchy organised recanalised thrombus. Small vessels were not significantly abnormal. The muscles showed degenerative changes more severe than those following denervation.

PATHOGENESIS

Vascular changes.—Impressions of the state of the vessels during exposure and just after rescue are based on limited observations in the prehyperæmic stage, and on analogy with conditions during general and local hypothermia.

During general hypothermia collapse of peripheral venous channels is noticed first. With continued hypothermia, constriction of the large arteries occurs. The blood-pressure and peripheral pulse may be unrecordable for several hours, yet neither vascular occlusion nor thrombosis is a complication. Blood continues to flow in the arterial channels because arterial punctures are possible (Talbott 1941).

Coldness of the affected parts in the prehyperæmic stage indicates narrowing of arteries or arterioles. That large arteries are narrowed is shown by the absence of peripheral pulses; in one case pulsation returned in the left dorsalis pedis 2½ hours after rescue, and 4 hours after rescue in the right. This observation also suggests that the vessels are narrowed by contraction or œdema of their walls rather than by obstruction by clot. This narrowing is attributable to the action of cold, direct or through the nervous system (see Pickering 1932). Intimal changes in vessels may in some cases lead to thrombosis, although, according to Allen (1941), cold seems to inhibit intravascular clotting. Judging from the findings of Brooks and Duncan (1940b), however, it is probably not necessary for the production of gangrene that ischæmia should be complete, or that thrombosis should occur. Indeed, vessels may remain patent, and their contents fluid, even after gangrene has set in.

The transition to the hyperæmic stage often occurs suddenly, presumably when warmth to the body and limbs overcomes the vasoconstriction which resulted from cold. The excessive vasodilatation which follows may be due to three factors—inflammation, damage to vessels and vasomotor paralysis. Inflammatory response to damage by cold is recognisable in tissues exposed at temperatures below 15° C. (Lewis 1941), and would explain early hyperæmia, swelling, pain and tenderness. Heat and redness in relation to blisters, gangrene and infections at any stage are also inflammatory. Direct damage to vessels by cold or ischæmia is a possibility. Such damage to arterioles, if present, cannot be

great, for the arterioles (see below) retain their ability to respond to circulating adrenaline. Damage to capillaries, however, may explain both the persistent tendency to œdema and the intensity of skin colour, which, deepening on dependency of the limb and blanching on elevation, indicates a dilated capillary bed.§ Finally, the vasodilatation may result partly from interruption of vasoconstrictor fibres in the peripheral nerves. In cases of immersion foot in the hyperæmic stage during exposure of the body in a cool room, the extremities remain hot instead of cooling, and their temperature is not significantly altered by immersion of other limbs in hot or cold water—i.e., vasomotor reflex responses are absent.

In one experiment, the external popliteal nerve was blocked with local anæsthetic. In spite of the completeness of the block, as indicated by the resulting anæsthesia, analgesia, anhidrosis and muscular paralysis, there was no rise in temperature in the skin of those parts of the dorsum of the foot and toes whose vessels are normally under the control of vasoconstrictor fibres from the external popliteal nerve.‖ In the same patient, skin vessels of an affected extremity were shown to be hypersensitive to physiological amounts of circulating adrenaline secreted in response to insulin hypoglycæmia. Similar vascular hypersensitiveness to circulating adrenaline is known to occur 8–10 days after post-ganglionic sympathectomy, when the vasoconstrictor fibres have degenerated.

These findings do not in themselves prove the existence of vasomotor paralysis; any inflammatory reddening might behave similarly. There is, however, supporting collateral evidence. Histologically, degeneration is seen in about 90% of nerve-fibres in affected nerve trunks, and clinically there is evidence of degeneration and regeneration in fibres conveying motor, sensory and sudomotor impulses; accompanying vascular phenomena suggest that vasoconstrictor fibres are also involved. After the nerves have had time to degenerate, faradic stimulation does not give rise to sudomotor and pilomotor responses (in the feet, however, pilomotor responses may be unobtainable even in normal individuals). As after sympathectomy, electrical resistance of the skin is greatly increased. Events during the posthyperæmic stage (see below) are also significant; cooling (perhaps with a cold-sensitive state), partial recovery of sensation (with hyperpathia) and of sweating (with marginal hyperhidrosis) appear after the same interval, as if all were dependent on one factor; this factor may be partial re-innervation of the end-organs or effector organs concerned.

In the posthyperæmic stage the skin may become cooler before reflex vasomotor activity is regained. Most of this cooling is probably due to lessening of inflammation; some may be due, however, to an increase in intrinsic arteriolar tone such as is known to occur 2–3 weeks after post-ganglionic sympathectomy or after section of peripheral nerves containing vasoconstrictor fibres (White and Smithwick 1942). After immersion injuries, in which factors other than nerve damage play a part, this recovery of vascular tone tends to come later than after sympathectomy. The skin vessels of the cool limb, even if not yet under nervous control, are capable of dilating in response to tissue damage as from burns or infections. When the damaged vasomotor nerve-fibres have regenerated reflex nervous control returns. During or after this regeneration, the vessel walls may display a hypersensitiveness to cold in the form of Raynaud's phenomenon, or of delay in vasodilatation following return to warm environment.¶

Changes in nerves.—The extensive cutaneous anæsthesia observed just after rescue might be due to a combined effect of cold and ischæmia. That cold can act directly on nerve-endings is suggested by unpublished observations of Lewis; after cooling a portion of skin, anæsthesia developed rapidly and it fitted accurately and was limited to the area cooled. The action of cold on nerve trunks was demonstrated by Bickford (1939); cooling the ulnar nerve blocked its motor, sensory, vasomotor and sudomotor impulses. It is necessary, however, to distinguish between the effects of temporary interruptions of nerve-impulses and those of actual damage to nerves. No record has been found of nerve degeneration experimentally produced by cooling, short of freezing, with the blood-supply intact.

Lake (1917) observed that cultures of embryo tissues, including nerves, derived from warm-blooded animals, were destroyed by temperatures of −6° C. or less, and were adversely affected by temperatures between 5° and 15° C., but were not damaged by storage at or near 0° C. These experiments on isolated tissues, although interesting, are not necessarily applicable to nerves in the intact organism. Talbott (1941) states, however, that during local hypothermia a circumscribed area of the body may be maintained between 40° and 50° F. (5–10° C.) for several months without damage or destruction of normal tissues; perhaps because, so long as the rest of the body is kept warm, circulation through the cooled part is not interrupted.

On the other hand, ischæmia of a limb without cooling results in motor, sensory, vasomotor and sudomotor paralyses, and if ischæmia is prolonged the nerves degenerate. In acute experiments, at least, sensory loss is of the glove and sock type, more extensive on palmar and plantar than on dorsal surfaces (Lewis 1931), a distribution similar to that found in immersion foot. Quickly reversible damage by anoxia might account for proximal parts of the extensive anæsthesia found just after rescue, less transient anæsthesia in distal parts being due to more serious nerve damage. Little is known of the duration of ischæmia needed to produce nerve degeneration; it is probably less than that necessary for gangrene.

Ligation of rats' hind limbs for 4–4½ hours caused sensory loss and paralysis of a duration compatible with degeneration and regeneration (Allen 1938). Highet and Holmes (1942) produced complete wallerian degeneration of the sciatic nerve by 3 hours' tight ligation of the rabbit's hind limb, the sciatic nerve being excluded from the ligatures.

In these two sets of experiments arterial spasm probably persisted long after removal of the ligatures (cf. Barnes and Trueta 1942); the duration of ischæmia needed for nerve degeneration may thus be much more than 3–4½ hours.

Ischæmia, combined with cold, takes longer to produce nerve degeneration or tissue necrosis than does ischæmia without cooling.

Bloodless limb tissues, which die in 12–15 hours at room temperature, will if cooled to 5° C. survive for over 50 hours without subsequent gangrene (Allen 1941). In rats' tails rendered anæmic by pressure of 130 mm. Hg, cooling to 5° C. increased the period needed to produce gangrene from 14–18 hours to 48–96 hours; at both high and low temperatures, periods of complete ischæmia less than those necessary for massive necrosis led to extensive fibrous replacement of muscles and nerves (Brooks and Duncan 1940a). Incomplete ischæmia from pressures less than 130 mm. Hg also damaged muscles and nerves, although after a longer time (Brooks and Duncan 1940b).

The importance of differences in the degree of ischæmia is stressed by Highet and Holmes (1942), who repeated the procedure of Griffiths (1940)—ligation of the common iliac and common femoral arteries—in an endeavour to produce Volkmann's ischæmic paralysis.

Highet and Holmes found, according to the completeness of the ischæmia attained, (1) nerve degeneration; (2) nerve degeneration with necrosis and contracture of muscles; or (3) nerve degeneration with gangrene of the extremity. Demyelination appeared a little earlier than axonal disintegration, and at proximal levels might be present where axons were intact. They were unable to produce, in rabbits, extensive fibrosis (collagenisation) of nerves such as they found in long-standing cases of Volkmann's paralysis.

§ It is at first sight surprising that this intense colour, in warm skin, is tinged with blue. Blood flowing rapidly through dilated skin capillaries could be bluish only if oxygen were being abstracted from it even more quickly than occurs in inflamed skin, which is unlikely. It is more probable that the blood flow through the capillary bed is somewhat slow, allowing excessive abstraction of oxygen, and that the warmth of the skin is due to rapid flow of blood through widely patent arterio-venous shunts (the result of denervation, Clark 1938) in the peripheral parts, and through the superficial veins into which they drain.

‖ Nerve-block is used in this way to test the completeness of a sympathectomy (White and Smithwick 1942). Although in the test described above the skin of the parts was already warm (28–31 C.), the absence of any further rise in temperature after nerve-block suggests that the vessels, before the nerve was blocked, were not receiving any vasoconstrictor impulses.

¶ Unpublished observations of R. T. Grant are in keeping with the suggestion that partial re-innervation of vessels may be responsible for the cold-sensitive state and for the development of Raynaud's phenomenon.

In immersion foot, mode of recovery and histological findings spoke against extensive fibrosis of muscle and nerve. As already indicated, however, absence of fibrosis does not exclude ischæmia as a factor in nerve damage.

The final verdict must await more definite evidence, particularly as to the direct effect on nerves of prolonged cold, short of freezing, with the blood-supply intact. Meanwhile one must regard ischæmia, probably incomplete, and with its action retarded by cold, as the most likely cause of nerve damage in immersion foot.

The delaying effect of cold, in the experimental work just quoted, makes it surprising that nerve degeneration should have occurred at all, as it did in some cases, after so short an exposure as 22 hours, or in one instance 14 hours at 3·5–5° C. The explanation may be that, while the limb is being warmed after rescue, the temperature of the tissues including the nerves is raised by heat applied from without before their blood-supply is restored by relaxation of the main arteries; their oxygen requirement then greatly exceeds the supply (intervals of 2½ and 4 hours between rescue and reappearance of dorsalis pedis pulse have already been referred to). During a few hours of coincident warmth and ischæmia, after rescue, more damage may be done than during the actual exposure. There is already clinical experience that rapid warming of chilled limbs after exposure is deleterious, and in some countries it is customary to keep such limbs cool with ice or snow while warmth is applied to the body. This point, with its obvious bearing on treatment, calls for further experimental investigation.**

Changes in skin.—Blistering must be regarded as a reaction of the cells and small blood-vessels of the skin to damage by cold, although maceration of skin by imbibition of water may play a part. Increased capillary permeability and increased blood-flow in the hyperæmic stage, producing a general tendency to œdema, may contribute to the production of blisters; this may help to explain why in some cases blisters do not appear until the 8th or 10th day after rescue, though in others they are seen during the first 3 days. In general, the incidence of blistering is irregular and unrelated to the severity of the damage to vessels and nerves; its occurrence in the late hyperæmic and posthyperæmic stages, if patients have walked too much or worn tight shoes, suggests that in these cases minor local trauma may be the determining factor.

PROPHYLAXIS AND TREATMENT

Once cold and wet penetrate, boots should be discarded before they become tight. The value of greasing the skin is limited. Rubbing with oil aids circulation temporarily, but may damage anæsthetic feet. Active movements are valuable; postures impeding circulation should be avoided (see also under causation).

The rescued man must be carried, not allowed to walk on damaged feet. The aim is to warm his body, keeping the extremities cool. Stripped of wet clothing, he is wrapped in blankets, hands and feet exposed. He is given hot drinks, but not left near a fire or in an overheated room. Hot bottles to the feet and washing in warm—even luke-warm—water are forbidden.

The feet, insensitive and fragile, may be seriously damaged by "trivial" injury. Massage is contra-indicated. Patients are kept in bed, sometimes for many weeks; early walking may cause excoriation, blistering or increased swelling. Feet are raised on pillows, exposed to the air, and kept dry. Sulphanilamide powder may be applied to wounds and blisters. Beneficial results from "dry cooling" the hot limbs with fans or ice bags are reported from Canada. The following instructions are given to convalescents:

"Use well-fitting shoes or boots. Look out for inwardly projecting nails. Change your socks daily. Sprinkle inside your socks some talcum powder mixed with boracic powder (3 parts to 1 part). Do not walk long distances. Remember your feet are still insensitive and may easily blister without your feeling discomfort. You may wash your feet or take a bath, but avoid putting your feet into anything but luke-warm water. Dry thoroughly after washing. If your feet swell or show signs of blistering or redness, rest in bed and get medical advice. Nails to be cut straight and with great care to avoid injury to the skin. Do not cut corns or apply caustic to them. Treat your feet as if they were made of porcelain. Be on your guard to prevent others damaging your feet by treading on them."

** Exudation, especially in chilled limbs which have been rapidly warmed, is another possible cause for damage to nerves (cf. Lake 1917, Smith, Ritchie and Dawson 1915). In the present investigation, however, there was no obvious correlation between exudation and nerve damage; anæsthesia was more extensive in the prehyperæmic stage, when swelling was slight, than in the hyperæmic stage when swelling had often greatly increased.

SUMMARY

Men exposed in open boats or rafts, with their limbs immersed in sea water at −1·9° to 10° C., may show evidence of damage to peripheral vessels, nerves, muscles and skin. A similar condition may affect extremities exposed to cold without immersion, provided the degree of cold is insufficient to cause frost-bite.

After a short prehyperæmic stage there is a stage of hyperæmia in which the affected parts become hot, red and painful, more swollen and perhaps blistered. Gangrene, if present, is nearly always superficial. In severe cases the results of nerve degeneration in the cooled tissues are evident in sensory loss, motor, vasomotor and sudomotor paralyses.

In the posthyperæmic stage inflammation subsides, vascular tone recovers, the skin temperature falls and the vessels may become hypersensitive to cold. By this time the patient is usually free from swelling, pain and tingling. Complete recovery, which must await regeneration of peripheral nerves, is preceded by signs suggesting partial re-innervation of end organs and effector organs—cooling (with a cold-sensitive state), partial recovery of sensation (with hyperpathia) and of sweating (with marginal hyperdrosis).

Late sequels included recurrence of pain, tingling, swelling or blisters; persistence of a cold-sensitive state or of hyperhidrosis; and occasionally circulatory defects suggestive of vascular occlusion.

Probably injudicious warming of affected limbs after rescue accentuates damage by raising the metabolic demands of the tissues while they are still ischæmic. For some hours after rescue such limbs should be kept cool while the patients' bodies are being warmed.

The work is still in progress, and some statements made here may need correction or amplification; more pathological material and more observations in mild cases and earlier stages are needed, and certain experimental findings need confirmation.

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MEDICAL HONOURS.—The DSO has been awarded to T/Surgeon Lieutenant M. P. Martin, MRCS, RNVR and the DSC to Prob. T/Surgeon Lieutenant T. P. Storey, MRCS, RNVR, for gallantry, daring and skill in the combined attack on Dieppe. The RNVR officers' decoration has also been awarded to acting Surgeon Commander J. B. Hutchison, FRCSE, and to acting Surgeon Commander D. W. Bawtree, FRCSE.

INFECTIOUS MONONUCLEOSIS

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THE unit has recently cared for 20 patients with infectious mononucleosis in a period of eight months. This series illustrates the protean manifestations of a disease the ætiology of which continues to be obscure and the serology unexplained.

Distribution.—The group of patients was equally divided between the sexes; 16 of the cases were between 18 and 25 years of age, the age-limits being 10 and 34 years. All but 4 of the patients were in the Armed Services. With an average of 2 or 3 admissions per month from November, 1941, to June, 1942, seasonal variation was not evident.

Onset and duration—In 3 patients the onset was sudden; in the remainder it was gradual. The duration of the disease varied irregularly between 8 and 25 days. Clinical improvement was fairly rapid—a matter of a few days in nearly a third of the cases. It was more gradual in the remainder.

Symptoms.—Fatigue was commonly one of the first symptoms noted. A sore throat was complained of by all but one patient, while headache, a swelling and tenderness of cervical lymph-nodes occurred in the majority. The cervical lymph-nodes in some produced pain and stiffness of the neck. Four jaundiced patients had nausea and epigastric discomfort, associated in one case with vomiting. These symptoms occurred in only one of the non-jaundiced cases. Severe lumbar pain developed in one patient with hæmaturia. The degree of fever varied, being low-grade or of short duration in 15 patients; 2 patients showed well-marked daily fluctuations between 99° and 103° F. over a 10-day period and 2 others had a low-grade fever persisting for nearly 2 weeks; 1 patient had a sustained pyrexia of 102° to 103° F., which fell by crisis after 6 days.

PHYSICAL FINDINGS

Skin.—Rashes appeared in 5 of the 20 cases. This incidence is higher than that encountered by Bernstein (1940), 9% of 65 cases, or by Sadusk (1941) 4 of 54 cases. These rashes were of three types; morbilliform, scarlatiniform and erythema iris. A morbilliform rash occurred in 3 cases, in each of which there was an associated jaundice. In 2 of the cases this rash appeared on the 7th day of the disease. It consisted of coppery maculopapules, extending over the trunk and down the extremities to the backs of the hands and feet. These lesions, lasting 3 to 4 days, were at first discrete and then merged into large confluent blotches, particularly on the trunk; palms and soles were spared. In 1 patient a morbilliform rash developed on the 16th day and was limited to the elbow regions. These morbilliform rashes left a transient brownish discoloration of the skin. Itching was slight. A scarlatiniform rash occurred over the trunk and abdomen of 1 patient on the 6th day of the disease and faded in a few days. An erythema iris type of rash developed in another patient on the 6th day. It began with redness and tingling of the hands; next day white swellings 1–2 cm. in diameter and surrounded by reddish rings appeared, chiefly on the palms. This rash persisted for 10 days.

Eyes.—Seven of 20 patients had hyperæmia of the conjunctivæ at some stage of their illness. Two patients had puffiness of the eyelids; in 1 of these the œdema of the lids was associated with extreme enlargement of the cervical lymph-nodes and possibly was due to pressure on the jugular veins.

Oral cavity.—Petechiæ were present over the oral mucosa in 8 cases; 3 of these had a concomitant morbilliform rash and icterus. One of these 3 had extremely numerous petechiæ in the mouth and hæmaturia; he had no additional hæmorrhagic phenomena. Another type of mouth lesion consisted of tender irregular red papules over the hard palate, measuring 0·5 cm. in diameter, which occurred in 1 case. These were discovered on the 14th day, when the patient complained of soreness of the mouth; they lasted 3 days.

Tonsils and adenoids.—Enlargement of the tonsils was present in 17 of the 20 patients. Two patients, the most severely ill in the entire series, had tonsils meeting in the midline, which caused considerable difficulty in swallowing. An easily removed grey-white membranous exudate covered the enlarged tonsils in 10 cases. In no patient did membrane occur without tonsillar enlargement. Adenoid enlargement was suggested in 4 cases—a child and 3 adults—all of whom developed almost complete nasal obstruction and an adenoid tone of voice. A lateral X ray of the head and pharynx in one of these cases demonstrated enlarged adenoids.

Lymph-nodes.—Enlargement of the cervical lymph-nodes, particularly at the angles of the jaw, was common to all cases. These nodes were often tender. Axillary, epitrochlear and inguinal lymph-nodes were less constantly involved. Characteristically, the enlarged nodes regressed rapidly in size, once general recovery had set in.

Spleen and liver.—The spleen was palpable in 11 patients by the 2nd week of their illness. Often no enlargement was detectable in the first week. In some instances the spleen, not palpable with the patient in a recumbent position, was felt with the patient in the right lateral position with the knees drawn up and the left arm thrown to the right side of the bed. In all cases but one the splenic edge was palpated just below the left rib margin. The exception had a tender splenic edge 3 finger-breadths below the costal cage. He was also severely jaundiced and had a tender liver edge extending to the level of the umbilicus. No other instances of hapatomegaly were encountered.

Jaundice.—Seven patients had jaundice; 4 of them had clinical jaundice and, as discussed below, 3 others had laboratory evidence of subclinical icterus. Clinical jaundice developed in the latter part of the first week of illness in 3 patients. A fourth patient became icteric on the 16th day. As noted above, a morbilliform rash and oral petechiæ accompanied 3 cases with clinical jaundice.

LABORATORY FINDINGS

Heterophile antibodies.—Three types of heterophile antibodies are found in human sera, which agglutinate sheep erythrocytes. These are differentiated by whether or not they are absorbed by oxerythrocytes or guineapig kidney. One type, found in normal sera, is not absorbed by either reagent, whereas the type found in human sera after horse-serum injection is absorbed by both. In infectious mononucleosis, the diagnostic heterophile antibodies are absorbed by oxerythrocytes but not by guineapig kidney. The new modification of the Paul-Bunnell test, suggested by Barrett (1941), differentiates these three types of antibodies. It was used in the serological diagnosis of all 20 patients in the present series. By this test sheep-cell agglutinins in a titre of 1 : 40 or above are considered diagnostic, if they are absorbed by oxerythrocytes. In this group of 20 cases all had a titre of 1 : 160 or higher, except for a single titre of 1 : 80. The Barrett test was repeated in 6 cases. In all of these the titres of the later sera showed a rise during the 2nd or 3rd week. In 2 cases the sheep-cell agglutination test was negative during the 1st week but repeated tests gave strongly positive results at the beginning of the 3rd week. The sera of 4 patients had titres reaching a height of 1 : 2560, 2 in the 1st week and 2 in the 3rd week. There was no constant relationship between the height of the titre and the clinical severity of the illness. Unfortunately, the duration of the elevated heterophile antibody titre could not be followed owing to the mobility of the military population. One of our hospital employees, however, had a titre of 1 : 80 three months after the onset of her illness.

Leucocytes.—There was a leucocytosis in all cases at some time during the first 2 weeks. Within this period every individual reached a total leucocyte count of 10,000 per c.mm. or above. The peak of the leucocytosis might occur in the 1st, 2nd or 3rd week, there being no regularity among the cases. Leucocyte counts ranged from 4300 to 32,000 per c.mm.

Two patients had an initial leucopenia. One of these had a total leucocyte count of 4300 per c.mm. on the 10th day, which rose to 21,000 per c.mm. on the 19th day. The polymorphonuclear neutrophils in this case showed the greatest fall, numbering 1720 per c.mm. on the 10th day. Another case was similar, with 1760

polymorphonuclear neutrophils per c.mm. in a total leucocyte count of 5200 per c.mm. on the 7th day. In this last case the total white count was 15,000 per c.mm. a week later.

It has been suggested that the so-called anginose type of infectious mononucleosis is due to a granulocytopenia. Among our cases 9 had granulocyte counts below 2000 per c.mm., the lowest being 900 per c.mm. The 2 severest anginose cases had normal or slightly increased polymorphonuclear counts of 4500 and 6800 per c.mm. In all of our patients there was a relative or absolute decrease in polymorphonuclear neutrophils, whereas in many instances the degree of secondary infection had led one to expect a considerable polymorphonuclear response. A suppression of polymorphonuclears therefore appears to have been present. Barber (1941) found similar granulocyte counts reaching as low as 960 per c.mm. in a series of 7 patients who had the anginose type of disease.

The percentage of mononuclear cells ranged from 68% to 78% as the maximum response in each patient. All smears showed varying numbers of atypical lymphocytes. We do not feel, however, that there is any one particular cell type peculiar to, or specifically diagnostic of, infectious mononucleosis. The chief characteristic of the "atypical" lymphocyte, as stated by Bernstein, is its variability. Among the salient features common to many of the atypical lymphocytes are a deep and coarsely staining nucleus, which often shows fenestration and an irregular shape. The cells are all roughly the size of large lymphocytes.

Liver studies.—The van den Bergh test gave a direct reaction in 5 patients, all of whom showed bile in the urine. Three patients with obvious jaundice had serum levels of 4·5–7·5 mg. of bilirubin per 100 c.cm. and a 4th patient had minimal jaundice with 1·4 mg. per 100 c.cm. The 5th patient was deeply icteric; on the 11th day of his illness his cholesterol was 285 mg. per 100 c.cm., phosphatase 26, Bodansky units and bilirubin 1·5 mg. per 100 c.cm. The low serum bilirubin was associated with a fading icterus. A liver-punch biopsy specimen was reported as follows by Prof. J. H. Dible of the British Postgraduate Medical School.

The sections show a well-marked focal acute hepatitis. The maximum change is seen in the portal tracts of the lobules where there is loss of liver cells and a well-developed histiocytic reaction with some early proliferation of bile-ducts. There are also isolated foci of similar histiocyte reaction in other parts of certain of the lobules and the sinusoids show an excess of cells, some of which are Kupffer cells and others resemble monocytes. The glycogen content of the hepatic cells is well preserved and the general appearances suggest that an earlier phase of necrosis has preceded the present histiocytic reaction. The reticular pattern of the lobules is disturbed in the affected portal zones, but there is no true fibrosis.

Urine.—Bile was demonstrated in the urine of 7 cases, 4 of whom were clinically jaundiced. One patient had hæmaturia, showing 10–30 erythrocytes in the spun sediment throughout the 3rd week of his disease. There was no indication that any other cause was responsible for the hæmaturia. He had a normal intravenous urogram and had received no sulphonamides.

Throat cultures in 12 cases demonstrated wide variation, 4 showing the usual throat flora. *Streptococcus pyogenes* belonging to various groups occurred in the other cases. One case showed *Strep. pyogenes* group A, another showed group C, type 21, and 3 cases showed *Strep. pyogenes* not belonging to groups A, C or G. Three patients had pharyngeal cultures showing *Strep. viridans*. No one organism was common to any significant number of cases. Eight cultures for *Corynebacterium diphtheriæ* were negative. Fusiform bacilli and spirilla were looked for in two cases and found in both.

Cerebrospinal fluid.—Lumbar punctures gave negative results in 2 of 4 cases subjected to this procedure. One patient had a distinct encephalitis, as evidenced by severe headache, well-marked drowsiness, nuchal rigidity and an irrational state. He had 56 white cells per c.mm. of spinal fluid, 80% of which were lymphocytes; protein and pressure were normal. Another patient without meningeal signs or symptoms had 30 leucocytes per c.mm. of spinal fluid, again chiefly lymphocytes; protein and pressure were normal.

Sedimentation-rate.—This examination performed in 4 cases in an active stage of the disease was within normal limits for 3 cases and slightly elevated for the 4th case. The 4th case was the only one having pyrexia, which was slight.

Serology.—Hinton tests (a flocculation test for syphilis) was done in all cases and were negative in the entire group. Wassermann reactions done in 9 cases were positive in 1. This patient was positive on the 11th day, but negative on the 19th day. With 2 exceptions only 1 of either of these examinations was carried out in the individual case. As the state of positive serology is known to be transitory, often lasting only 3–4 days, repeated tests might have yielded different results.

TREATMENT

Treatment was largely palliative. Five patients with well-marked pharyngeal involvement and showing streptococci in throat cultures received full doses of sulphadiazine (30–40 g. in 5 or 6 days) without demonstrable effect on the clinical course. Sears (1942) has suggested that sulphonamides may be hazardous in infectious mononucleosis, because of the frequent coexistence of granulocytopenia. He cites a case where polymorphonuclears were reduced to 225 per c.mm. Sulphadiazine was given to 5 patients in our series; in 2, the number of polymorphonuclears was slightly depressed after this drug, and in 2 it was elevated. Three cases suspected of diphtheria were given 20,000–60,000 units of antitoxin, again without appreciable effect, but we recommend this treatment where there is any doubt as to the initial diagnosis. Scarlet fever convalescent serum, as recommended by Berkeley (1942), was given in 1 case. The patient, however, had already shown signs of recovery and no benefit could be ascribed to the serum.

EPIDEMIOLOGICAL NOTE

Generally speaking, the infectivity of infectious mononucleosis did not appear to be high. Sixteen of the 20 patients were military but all came from different localities without any contact with each other. Likely contacts of 2 cases were examined and blood smears and heterophile agglutination tests done. Of the 25 contacts, 1 man was found to have a positive heterophile test, but he denied any sort of illness in the preceding 6 months. Some epidemics of this disease have been reported, but in the main the disease remains one of low infectivity with sporadic occurrences.

DIFFERENTIAL DIAGNOSIS AND ÆTIOLOGY

In 6 of 20 patients the diagnosis before admission was correct. An equal number were sent in as acute tonsillitis, and 3 of the remainder were considered by their referring physicians to have diphtheria. With the present degree of uncertainty concerning this disease a final diagnosis of infectious mononucleosis should be reserved for cases not only clinically compatible but also showing both the hæmatologic and serologic responses. Three patients showing well-marked lymphocytosis and glandular enlargement, but without the serologic response, were not considered to have infectious mononucleosis. These 3 patients showed persistent lymphocytosis, together with cervical lymphadenopathy. The lymphocytes were all small and the sheep-cell agglutination tests negative. There were certain similarities in these 3 cases to those described by Smith (1941) as infectious lymphocytosis.

One of our patients was referred with the diagnosis of infectious hepatitis, having only the symptoms of catarrhal jaundice. More than 50 other men from his same military unit were admitted at about the same time, suffering from an infectious hepatitis. Although the patient under consideration resembled somewhat the other cases of his unit, his peripheral blood showed a characteristic lymphocytosis and the heterophile antibody test was positive 1 : 640. A liver biopsy was performed on this patient, as discussed above.

The ætiology of this disease remains obscure. Nettleship (1942) has recently reported the production of small white pearly growths infiltrated with mononuclear cells when he inoculated chorio-allantoic membranes with filtrates of nasal washings and whole

blood of patients. Cerebrospinal fluid from our one case of encephalitis accompanying this disease was inoculated intracerebrally into mice and rabbits and on to the chorio-allantoic membrane of eggs without any positive results.

DISCUSSION

The present series of cases seems to indicate that the infectivity and seasonal variation of infectious mononucleosis is not great. The military stations from which most of our patients came provided only isolated instances, and there were no outbreaks such as might be expected in other infectious diseases under the conditions of wartime crowding.

There seems to be a growing awareness of the diagnosis of this disease. About a third of the patients were referred with a correct diagnosis. This is a fairly high proportion when one considers the protean manifestations and the similarity to other conditions. Werlin and others (1941) list a series of 21 patients, all of whom were sent in with mistaken diagnoses. A sheep-cell agglutination test may be negative in the first 2 weeks of the disease, and for this reason repeated tests are indicated in suggestive cases. This may explain some cases reported in the past of infectious mononucleosis without a positive heterophile test.

We have not found any therapy to be more than palliative. Recently Hoffman and others (1942) have reported that sulphathiazole was effective in relieving symptoms in 9 cases. They state that in untreated cases symptoms usually continue for 2–4 months. This was contrary to our experience, for many of our cases cleared up spontaneously and fairly rapidly in 3–4 weeks. We feel that it may often be difficult to impute success to therapy when one considers the variability in duration of the disease. Berkeley (1942) has ascribed therapeutic value to scarlet fever convalescent serum on the basis of 4 cases ; 3 of his cases obtained symptomatic relief between the 17th and 23rd days of disease. We have tried this form of therapy in 1 case. Many patients with infectious mononucleosis get well spontaneously in this period, and Berkeley's results are inconclusive.

Some believe that a diagnosis of infectious mononucleosis can be made on the basis of lymphocytosis without the presence of atypical lymphocytes, or a positive heterophile antibody test (Reyersbach and Lenert 1941). Abnormal lymphocytes and a positive sheep-cell agglutination test were found in all 20 cases of the present series and both are essential to a proper diagnosis.

No published report on the pathology of the liver in infectious mononucleosis has been encountered. The presence of parenchymatous changes is interesting in view of the frequent suggestion that jaundice in this disease is caused by pressure of enlarged lymph-nodes on the bile-ducts. It must be pointed out that this liver biopsy was taken from a patient who came from a community where an outbreak of another variety of hepatitis was taking place. However, this man fulfilled all the rigid criteria for infectious mononucleosis.

SUMMARY

Laboratory and clinical data on 20 cases of infectious mononucleosis are reviewed.

Four cases had clinical jaundice and 3 showed evidence of subclinical icterus.

A liver biopsy showing parenchymatous changes was obtained in one case.

The diagnosis of infectious mononucleosis was confirmed in all cases by heterophile antibody tests.

The blood smears showed a high lymphocytosis in all cases, and an absolute or relative decrease in polymorphonuclear cells in many.

No treatment proved effective.

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STERILISATION OF SULPHONAMIDES

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THE recent report [1] of a case of tetanus associated with the local application of a sulphonamide powder has impressed upon hospital authorities the need for issuing sulphonamide compounds for local use in a sterile form and in a sterile container. Tests which we have made show that the sulphonamide powders supplied in this country contain sporing organisms and that the cardboard containers in which the powders are supplied are heavily infected with sporing organisms including *Clostridium welchii*. We have by a simple procedure been able to issue sterilised preparations of the three common sulphonamides (sulphanilamide, sulphapyridine and sulphathiazole) in a sterile usable container without any apparent physical or chemical change in the powders.

TECHNIQUE OF STERILISATION

Wide-mouth screw-capped containers of 1 oz. capacity fitted with aluminium caps tightly screwed on, and red rubber washers—the LCC ' Universal Containers '—are sterilised in the autoclave at 15 lb. for 20 minutes. The sulphonamide powder is obtained from the manufacturers in clean screw-capped glass jars, and not in cardboard containers. The assistant who fills the bottles washes up as for a surgical dressing. A sheet of sterile kraft paper is placed on the bench, and, with a sterilised teaspoon and a 3-inch glass funnel cut off at the neck, the sulphonamide powder is placed in the previously sterilised universal containers. The powder is shaken down until the bottle is nearly full (approximately 10 grammes) and the cap is then *screwed tightly on*. When the batch is ready the bottles are placed in the autoclave and heated with the steam issuing freely for 20 minutes. The pressure is then raised to 10 lb. and allowed to act for 30–60 minutes. After removal from the autoclave, the bottles are immediately labelled, a different coloured ink being used on the label according to the contents—green for sulphanilamide, blue for sulphapyridine and red for sulphathiazole. For ease in applying the powder a perforated cap may be used as a sprinkler.

The rationale of the process is that, although the powder is in a tightly closed container, sterilisation is by moist heat because the powder normally contains 0·2–0·5% of water which in 10 g. of material is 0·02–0·05 c.cm. water. The water vapourises and permeates the powder completely as steam, being reabsorbed when the bottles cool down. The powder does not cake because there is no addition of moisture, while the comparatively low temperature of 116° C. does not alter the colour. If the powder is dried in the hot-air oven at 145–160° C. the moisture is evaporated, and the heat penetrates only by conduction from one granule of powder to another. Moreover organisms are much more resistant to dry heat than to moist heat, so that heating must be prolonged for 3–4 hours.[2] The method of autoclaving therefore kills the contaminating organisms more easily, quickly, and at a much lower temperature and avoids physical or chemical alteration of the powder.

In many hospital sterilisers, sterilisation at a pressure of 10 lb. is not very convenient since the valves are set to give higher pressures—15–20 lb. The sulphonamide powders may be sterilised at this higher pressure by the procedure outlined above without apparent detriment, except that there may be slight yellowish discoloration. At a pressure of 15–20 lb. for 20–30 minutes cultures of *Bacillus subtilis* spores dried on lint, enclosed in paper and placed at the bottom or in the middle of the container are invariably killed. At the lower pressure of 10 lb. for 1 hour, *B. subtilis* spores are also killed ; at 10 lb. for ½ hour not uniformly so.

A further advantage of the use of the screw-capped bottle is that when the cap is removed the whole top

1. *Pharmaceut. J.* May 30, 1942, p. 192. *Lancet*, June 27, 1942, p. 770.
2. *Lancet*, Sept. 12, 1942, p. 322.

and lip of the bottle is sterile, having been covered by the screw-cap, and the powder can be poured out of the bottle directly on the wound without fear of contamination. Alternatively a perforated cap may be used which acts as a sprinkler. An important point in the process is to introduce as little extra contamination as possible. Thus, the manufacturer must try to avoid gross contamination in the preparation of the powder, while the bottles are first sterilised and then filled with powder under as aseptic conditions as possible. The fewer organisms there are to kill, the easier it is to kill them.

USE IN THE OPERATING-THEATRE

For use in the operating-theatre the following procedure is recommended. The container can be handled by the surgeon under sterile conditions, and a perforated cap enables the powder to be sprinkled easily and economically. The rubber washer is removed, and a hole ¼ in. in diameter is punched out of the centre of the metal cap. The rubber washer is reinserted, and the cap screwed on the bottle, which is sterilised before filling with the powder as previously described. After the bottles have been filled and tightly closed, they are marked on the top with a streak of cellulose paint to indicate the contents—green for sulphanilamide, blue for sulphapyridine, and red for sulphathiazole. When the paint is dry (in about 30 minutes) each bottle is wrapped in kraft paper (8 in. square), so that the twist of the paper is at the top of the bottle and in the same direction as tightening the screw. A mark may be made on the kraft-paper covering with an appropriately coloured crayon to indicate the particular sulphonamide.

The wrapped bottles are sterilised as above and on removal from the autoclave are labelled with a gummed label of the appropriate colour. When the surgeon in the theatre wants a container, the nurse untwists the paper from the top of the bottle until the cap and upper part are exposed. The surgeon grasps the top of the bottle and pulls it out of its paper wrapping which remains in the hands of the nurse.

To sprinkle the powder, the cap is removed and the rubber washer pushed out by passing a probe or the points of scissors through the perforation. The cap minus the washer is screwed on the bottle again and the powder sprinkled as required. If perforated screw-caps only are used, the bottles after filling must be wrapped in kraft paper and then sterilised and kept wrapped until required, otherwise the tops of the caps will become contaminated by dust and handling. Alternatively, a perforated cap without a washer may be used as a sprinkler. It is wrapped in kraft paper and sterilised with the bottle. When the powder is required the ordinary cap and washer are unscrewed, and the sterile perforated cap is unwrapped and placed on the bottle.

Medical Societies

BRITISH ORTHOPÆDIC ASSOCIATION

AT the annual meeting of the association in Nottingham on Sept. 25–26, under the presidency of Mr. G. R. GIRDLESTONE, FRCS, the principal subject discussed was the present arrangements and future plans for

Rehabilitation of the Injured

At Harlow Wood Orthopædic Hospital Mr. S. A. S. MALKIN, FRCSE, demonstrated the work of the hospital's remedial workshops, and a film was shown illustrating the methods employed there and at a special annexe in the occupational reconditioning of EMS casualty patients. Later at the Rehabilitation Centre for Miners at Berry Hill, near Mansfield, the subject was dealt with from the points of view of the surgeon, the employer, the industrial medical officer and the trade union.

Mr. E. A. NICOLL, FRCSE, surgeon in charge of the centre, said that the problem was threefold. First, there was the purely scientific aspect of physical restoration; secondly, the psychological one of obtaining the full coöperation of the patient; thirdly, and sometimes the most difficult, the sociological problem of obtaining the proper social context for the conduction of rehabilitation. As soon as injured, every working-man's first desire was to get well as soon as possible. It was when delay occurred that doubts and fears crept in. These must be removed, and morale and initiative maintained. Coöperation by the employer, the industrial medical officer and the trade union had produced, in his experience, a team in which the surgeon plays an important part from beginning to end. The result had been the almost complete disappearance of litigation. The statistical difference between a socialised and non-socialised accident service is at least 10% expressed in terms of men returned to pre-accident work, and that was something very considerable when expressed in the return of workmen to the vital man-power of the country.

Mr. GUY DE G. WARREN, speaking as an employer, gave an account of the organisation which was responsible for the development of the Berry Hill Centre. The Midland Colliery Owners Indemnity Association was formed by a group of associated companies to deal with the insurance risks of accident. It was not run for profit and represented the employment of over 100,000 men. With many others, they had been shocked by the state of the treatment of injuries as revealed in the report of the British Medical Association committee on fractures. The companies with which Mr. Warren was associated were able, first of all by subsidies, to ensure throughout the area the development of efficient fracture clinics, and this had resulted in an earlier restoration to some working capacity. It was soon appreciated that the lack of facilities for reconditioning prevented men from obtaining full recovery. The job was therefore completed by this rehabilitation centre, and it had been justified from the economic and humanitarian points of view. Any national hospital plan must include similar reconditioning schemes. From his experience he considered that one centre capable of dealing with 60 patients simultaneously should treat and discharge some 500 cases annually. Of accidents in the heavy industries which require hospital treatment, 20% need a course of rehabilitation, so that one unit appears to be necessary for a hospital or group of hospitals dealing with about 3000 such cases annually. On the other hand, the percentage of hospital accident cases other than those in heavy industries requiring rehabilitation treatment should not exceed 8%, and for these one unit should be sufficient to serve a group of hospitals admitting 8000 such cases a year. The workman must be dealt with in an atmosphere where he knew that everyone from the hospital to the employer was out to help. A man admitted to the centre was given the assurance of the surgeons that he could be improved and afterwards that work would be available for him. The growing utilisation of industrial medical officers in factories would help to foster greater care for the injured man after his return to industry.

Dr. DONALD STEWART, speaking as an industrial medical officer, said that production was now the paramount consideration. It was being somewhat retarded by absenteeism, partly due to injury and sickness. Injuries were seriously increasing, important factors being the amount of new and unskilled labour drafted into industry, often working under overcrowded and other difficult conditions. There was therefore overloading of the casualty and outpatient departments of hospitals in industrial areas, which had to carry on with diminished staffs and with difficulties in obtaining equipment and materials. There was a challenge to hospital services and the medical profession to see that an adequate service was maintained for people in production. Particular problems were provided by young persons and married women in industry, and by factory accidents at night-time and on Sundays. The industrial medical officer had an important function to perform in the general supervision of conditions of work and measures designed to prevent ill health and injury, in the initial treatment of accidents, and the follow-up of cases that can stay at work and of those who returned after treatment and rehabilitation. He is the one person who can interpret the wishes of the surgeon because of his knowledge of the conditions of work and the types of job available. There must be a steady improvement in the initial treatment of injuries. The sepsis-rate was high and insufficient care was taken of so-called minor injuries. In 1000 consecutive accidents in one factory 52% were finger injuries only; the incapacity-rate was large because they were not treated

with the seriousness due to them. One big problem was to provide an adequate service for the treatment of injuries in small factories which could not have their own medical units. In Birmingham they had proposed the provision of a travelling surgical unit, thus taking the hospital to the factory for the more serious injuries which should be dealt with in the initial stage on the spot. (One such unit provided by the Austin Motor Company was demonstrated for the meeting.)

Mr. J. L. SMYTH, for the trade unions, felt that more should be done to prevent accidents by ensuring proper selection of personnel so that people did not work on jobs for which they were unfitted. He made a plea for a greater understanding of each other's job as between the doctor and the workman. The ignorance of the doctor about working conditions was often responsible for much misunderstanding, particularly as it referred to certification under the Workmen's Compensation Act. At the same time the workman often misunderstood the doctor's position. The industrial doctor may be handicapped because he is himself an employee of the firm. His job, however, was to serve the workers, and probably he would himself prefer to be independent altogether of the management. He deprecated the controversies arising in the courts between the individual worker and employer, with lawyers and doctors ranged on either side to fight the matter out. The trade unions were delighted to have been associated with the development of the idea of rehabilitation centres such as had been outlined by Mr. Watson Jones. Those centres already in existence had furnished practical demonstration of their value. The Trade Union Congress had approved of the idea and called on its general council to demand the Minister of Health to bring about an intensive development of this service, which would include mobile medical units. The compensation bogy must be destroyed. He would like to see standardised records at all hospitals and the preservation of continuity of treatment.

In the discussion, Sir WALTER CITRINE remarked on the big element of conservatism to be overcome both on the part of doctors and workmen. There was no place for the consideration of economic motives. Their noblest aspiration should be by skill and organisation, whether in hospital or rehabilitation centre, to take away the disability produced by accident. Trade unions were willing to coöperate with anyone, whether employers or social agencies, if they were imbued with those ideals.

Mr. GEORGE PERKINS, FRCS, of Roehampton, emphasised the need for starting the work of reconditioning from the initiation of treatment in hospital and that the work should be throughout supervised both in hospital and centre by the surgeon in charge of the case.

Mr. R. WATSON JONES, FRCS, of Liverpool, said it was just as important to avoid the fear and litigious atmosphere that may develop after injury as to avoid non-union of a fracture. Every fracture surgeon must be more than a craftsman, he must be a psychologist. The newness of the idea of rehabilitation is only in putting forward the psychological aspect so prominently. Rehabilitation centres must not be a counterpart of the old massage departments of hospitals. They must be geographically separate, with the advantages of open air, freedom and separation from the hospital atmosphere. The problem was far more than economic or humanitarian; it was vital in war-time that every man should be back at work.

The PRESIDENT emphasised the important part played by Sir Robert Jones in the development of rehabilitation. It was he who in the last war had urged the value of active coöperation of mind and limb in the restoration of movement in stiff joints and in the restoration of muscle power and coördination. At the workshops at Shepherd's Bush he showed what could be done for the reconditioning of the disabled. The tragedy was that much of his teaching in this direction had been allowed to slide.

Reviews of Books

Obstetrics

Oxford Medical Outline Series. HERVEY CLOCK WILLIAMSON, MD, FACS, associate clinical professor of obstetrics, gynecology at Cornell University Medical College; GEORGE SCHAEFER, MD, assistant attending surgeon in gynecology clinic of St. Luke's Hospital. London: Humphrey Milford, Oxford University Press. Pp. 113. 12*s.* 6*d.*

THIS small volume does not pretend to be a textbook of obstetrics: it is just a synopsis of practical lectures, set out in telegraphic style. Controversy and hypothesis have been rigorously pruned out; bald facts are presented as a series of tabulated headings. The result is concise and quickly readable, covering almost every aspect of modern obstetric teaching. English students may find the details but not the fundamental principles of the text a little different from the home product, and this will do them no harm. Between each page there is a blank leaf for notes and diagrams—useful in a book which is not illustrated. It should prove of value for revision on the eve of the finals.

Vision: a Study of its Basis

S. HOWARD BARTLEY, Washington University School of Medicine. London: Macmillan. Pp. 350. 18*s.*

A BOOK on vision which does not describe the refractive system of the eye and gives theories of colour perception the cold shoulder is worth a second glance. Dr. Bartley's monograph contains almost nothing usually taught to medical students, but much which investigators are known to have been studying during the last dozen years. It has been written in the missionary spirit, to tell workers in other fields what modern problems of vision are and how they are being attacked by the experimental psychologist and physiologist—particularly the so-called electrophysiologist. It also throws out a hint to the neurophysiologist that the secret of cortical activity may not yield to the infinite exploration of neural elements and their interactions. In vision the retinal image and the mosaic of receptors appear superficially to have an obvious relationship; yet striking predictions of experimental results have been made on a theory which relates stimulated points not on an anatomical basis but according to the strength and direction of hypothetical visual field forces somewhat analogous in conception to gravitational and magnetic forces. This idea—revolutionary to most of us in this connexion—occupies only a fraction of the text, but is a sample of some of the challenging thoughts which the book brings to our notice. Most of the text is hard experimental fact. It is a book for which many have been waiting; but many will continue to wait because (except where personal interest fires his exposition) the author is not lucid, and much of his English is frankly bad. This is a pity; for, while some part of the book will be familiar ground to any specialist, few will possess such specialised knowledge as to enable them to read the whole without difficulty. A little more sympathy with the reader would have made all the difference; as an encouragement to the persevering it may be said that in general it improves as it goes on.

Surgery of the Ambulatory Patient

L. KRAEER FERGUSON, MD, FACS, assistant professor of surgery, University of Pennsylvania. London: J. B. Lippincott. Pp. 923. 63*s.*

THIS book covers far more than minor surgery, as usually understood. Dr. Ferguson, writing from personal experience, makes a strong case for ambulatory treatment of many conditions which in this country would be treated with the patient in bed. Descriptions of pathology, diagnosis and differential diagnosis are as full and clear as those of the surgical procedures advocated. A section on fractures by Dr. Louis Kaplan is particularly good. The work contains 645 illustrations, all of them apposite and well reproduced. Under the American system, surgeons work in office buildings which probably lend themselves more readily to efficient surgery on the ambulatory patient than do English consulting-rooms. Possibly the American patient is more stoical and coöperative than his English counterpart.

Messrs. H. K. LEWIS have published a supplement giving the names of the books which have been added to their library, up to the end of 1941, since the last complete catalogue was issued in 1937. The list of books is arranged alphabetically under the names of authors and there is also a classified index of subjects at the end. The supplement is on sale to subscribers to the library at 2*s.*, but as a guide to current literature on medicine and allied subjects many others will find it worth the 4*s.* which is charged to outsiders.

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THE LANCET

LONDON: SATURDAY, OCTOBER 17, 1942

IMMERSION FOOT

THE ill effects of chilling on the feet of soldiers has been recognised in many wars. There is a good description by LARREY from Napoleon's Russian campaign of 1812, and other accounts in the records of the Crimean war (1854–56) and Russo-Japanese war (1904–05). In 1914–18 many soldiers, especially in Flanders but also elsewhere, suffered from trench foot, which GRATTAN[1] in the official medical history likened to a large chilblain, and LORRAIN SMITH, RITCHIE and DAWSON[2] clearly differentiated from true frostbite. Hitherto the published cases have mainly been in soldiers, and the world war now raging may yet provide additional experience in our armies. So far, however, in this war the problem has arisen almost entirely in sailors, and it will be strange if some medical writings concerning them are not discovered from former days. Ships are torpedoed and sunk far from land and survivors are immersed while clinging to wreckage for many hours, or are huddled together, soaked and cold, in rafts or life-boats for many days. These happenings have provided a considerable experience of the effects of cold on the feet in men of the Royal Navy and Merchant Navy, as described by UNGLEY in our present issue.

The nomenclature, as UNGLEY points out, is unsatisfactory. Among our sailors the condition has become known as immersion foot, or (less commonly) lifeboat leg, but it may occur when feet are not immersed and the men not in lifeboats. The hands too and even the nose may be affected in a similar way. The same difficulty arose in the last war about trench foot, trench fever and trench nephritis (later changed to war nephritis), none of which were confined to the trenches. UNGLEY suggests the term "vasoneuropathy after chilling," based on the probable pathology of the condition he has seen in sailors; but it seems wise for the present to keep to the commonly used terms. The incidence of immersion foot has been mainly in northern waters with a sea temperature of 15° C. or below—often below 10° C., but above freezing-point. In its full-fledged state the condition is seen rarely, if at all, in survivors exposed in the warmer seas. There has been difficulty and confusion in distinguishing between the effects of actual freezing of the tissues (genuine frostbite) and the effects of prolonged chilling at temperatures above freezing-point. Clearly trench foot in soldiers (although often called trench frostbite) and immersion foot in sailors both fall into the second category. Genuine frostbite has been seen by UNGLEY in sailors during this war—in the fingers when holding on to frozen rigging and in the knees after bailing in ice-coated life-boats. Frostbite of the foot has probably not occurred in sailors, and in UNGLEY's two cases in which the fingers and knees were frostbitten the feet showed the typical phenomena due to immersion in water. The distinction is important since the two conditions—immersion foot (or hand) and frostbite—contrast strongly in the time of exposure, in their pathology and in measures for prophylaxis and treatment. It is obviously desirable to obtain material from early essential amputations for severe immersion foot, so that the pathology may be studied before any later effects of gangrene or sepsis have supervened. BLACKBURN, in UNGLEY's paper, describes the changes in vessels and nerves found in late cases of amputation, which alone have been available.

In attempts to elucidate the pathology of trench foot LORRAIN SMITH, RITCHIE and DAWSON carried out experiments on rabbits, in which a condition clinically very similar to the soldier's foot was easily induced. They noted that the chief effect was on the blood-vessels, whereas the nerves showed only œdematous swelling of axis cylinders (which they regarded as part of the general œdema of the foot) with no degenerative changes. In immersion foot the neuritic manifestations seem as a rule to be more severe and the resulting disability far longer lasting than in trench foot, but only careful pathological study and experiment can clear up this point and explain the mechanism of the nerve damage. BRUCE[3] drew attention to the frequency of fulminating tetanus in trench foot of soldiers, and prophylactic injection was ordered even when the skin was intact. This complication has not been seen in immersion foot. Complete gangrene of an immersion foot is uncommon, but unfortunately does occur. Far more often, as UNGLEY emphasises, the loss of tissue is superficial and even if the whole foot becomes black deep tissue loss may involve only the toes or parts of them. The main problem of immersion foot is the long incapacity that so often results, already lasting in some cases for over two years.

NEW OUTLOOK ON TUBERCULOSIS

THE publication last week of the Medical Research Council's report on tuberculosis in war-time gives us an opportunity to review the present trend of opinion on this hydra-headed disease and especially to study why, despite all improvements in diagnosis and therapy, early recognition and arrest of disease are still the exception rather than the rule. In the days when the stethoscope ruled it was often difficult to make an early diagnosis, and the wise physician when in doubt would describe the patient as "threatened" with tuberculosis. Modern X-ray technique enables us to see infiltrations unaccompanied by obvious symptoms and still less commonly by physical signs. Although the detection of tubercle bacilli in the sputum is more precise than any other method of diagnosis, the early case usually has no sputum and the diagnosis is mainly radiological; often a definite opinion can be given on a single film, but in difficult cases a second or a series of films may be required before a confident statement can be made. In some cases, particularly in routine periodic mass radiography, minute opacities appear and subsequently disappear in the course of a few months without any definite diagnosis being possible. It might be thought that these conditions would have led to over-diagnosis, and it is therefore disturbing to find, as Wing-Commander TRAIL pointed out in our last issue, that the proportion of early TB+ cases (B 1) to moderately advanced and advanced (B 2 and B 3) in the LCC area remains almost constant at 6% to 80% for the decade 1927–37. Trail gives the reason: "for diagnosis, doctor and patient must meet." But it is

1. Grattan, H. W. History of the Great War. Medical Services: Surgery of the War, 1922, vol. I, p. 169.
2. Lorrain Smith, J., Ritchie, J. and Dawson, J. *Lancet*, 1915, ii, 595.
3. Bruce, D. *Brit. med. J.* 1917, i, 48.

now generally recognised that radiological changes usually come before symptoms, and there is no answer to the MRC committee's statement that "in order to discover the disease before symptoms develop the initiative of the X-ray examination must pass from the patient to the doctor. This can be effected only by mass radiography."

The recommendations of the MRC committee are being acted on promptly by the Ministry of Health, and we are promised 30 units ready for use in a few months' time, each capable of doing 1000 miniatures a day. The committee suggest that these should be used in the first place in industries employing a large proportion of young workers, and also for nurses, medical students and merchant seamen. The superiority of radiological over clinical examination is well illustrated in Trail's survey which covered 30,130 young airmen of whom 0·22% had active and 0·36% inactive lesions; these men, it should be noted, formed a selected group as they had all passed a thorough clinical examination without the disease being detected. He estimates that in Great Britain among the supposedly healthy young adult population between 18 and 24 there are some 3 per 1000 with unsuspected active tuberculosis, making a total of about 15,000 in all. This observation throws doubt on the conclusions of the Horder Committee which state that the present system of medical examination of recruits reduces the number of cases of tuberculosis accepted by the Forces to an almost negligible figure. Fears have been expressed that the wide use of mass radiography will result in increased shortage of labour in factories engaged on important war work; it was the experience of Messrs. PHILIPS at Eindhoven that adoption of mass radiography was soon followed by so great a fall in absenteeism due to tuberculosis that the cost of the scheme was more than made up by the increased number of hours worked. It has also been objected against this method for detecting early cases that beds for tuberculous patients are already inadequate. A temporary increase of cases requiring treatment would be inevitable, but early diagnosis reduces the number of months of sanatorium treatment and should soon reduce the numbers of chronic cases needing institutional treatment. In any case, the shortage of nursing and domestic staff in sanatoriums, which now forms a serious handicap to the treatment of tuberculosis, must be faced.

The MRC committee have produced a report which should be widely read both inside and outside the profession. The probable causes of the increase of tuberculosis are discussed in detail, and the differences in the age-group incidence between this war and the last are examined. From this it may be concluded that although the evacuation of town children to rural areas where unpasteurised milk is drunk must have caused some increase in bovine tubercle the bulk of the increase is due to the human bacillus though how much is caused by increased infection under blackout and shelter conditions and how much by industrial fatigue and the strain of bombing cannot yet be determined. A recent paper[1] on tuberculosis in London in war-time shows that in this heavily bombed area the pulmonary tuberculosis death-rate has increased by 72% and the non-pulmonary by 67%, these increases being much greater than those found in the rest of the country; children were more affected than adults but there is evidence that pasteurisation has limited bovine infections and that the principal infecting source is human. Another thought-provoking report is that of the Prophit Survey of the Royal College of Physicians, summarised on p. 463; tuberculosis in young adults has been closely studied, especially by correlating Mantoux tests with X-ray examinations. The preliminary analysis shows that an appreciable proportion of young adults are now tuberculin negative, the figures for negative reactions among nursing entrants being 11·5 for voluntary hospitals and 17·8 for municipal. The survey was started in 1934 but was interrupted by the war. Their figures suggest that there is a useful correlation between the tuberculosis reactions and the development of tuberculous lesions, but before publishing them it was thought advisable to extend the period of observation.

The relative failure of treatment in pulmonary cases is naturally largely due to the rarity of early diagnosis; but this is by no means the whole story, since many cases which should have a good prognosis die from the disease. Tuberculosis mortality has been described as a social barometer. Probably the great fall in the incidence of the disease during the last two generations has been due more to improvement in the standard of living than to the work, good as it has been, of dispensaries and sanatoriums. The weak spot on the treatment side is the period following discharge from sanatorium; few patients at this stage can safely return to full-time work under ordinary industrial conditions, and they require plenty of good food and satisfactory housing conditions. At present, as HEAF and RUSBY[2] have calculated, allowances from public funds for the tuberculous patient who is unfit for work are so meagre that if the whole amount is spent on food only just enough to meet his requirements can be purchased. The patient with quiescent disease steers a perilous course between the Scylla of underfeeding and the Charybdis of overwork. The MRC committee's case for the introduction of satisfactory methods of industrial rehabilitation is in fact unanswerable. The financial position of the worker drawing NHI disablement benefit of 10*s*. 6*d*. a week without allowance to his family is contrasted with that of the soldier disabled by tuberculosis who receives 37*s*. 6*d*. a week plus 9*s*. 2*d*. for wife, 7*s*. 1*d*. for first child and 5*s*. 5*d*. for each other child—yet the need is the same. Among the recommendations made for the rehabilitation of convalescent non-infective cases are part-time work and "modified" work—that is, work under less strenuous conditions than usual—in each case the wages earned being subsidised from national funds in order to ensure an adequate standard of living.

Mass radiography cannot be used extensively in diagnosis unless the economic penalty now attached to tuberculosis is removed; while it exists adequate coöperation from the workers cannot be expected. The Minister's announcement on Oct. 8 that local authorities have been authorised to grant financial assistance while the breadwinner is undergoing sanatorium treatment is of happy augury. If the Government would go one step further and announce pensions for chronic cases and subsidised wages during rehabilitation, the spectre of want could be banished from the tuberculous population.

1. Daley, W. Allen and Benjamin, B. *Brit. med. J.* Oct. 10, p. 417.

2. Heaf, F. R. G. and Rusby, N. L. *Tubercle*, 1940, **21**, 17.

ELECTROENCEPHALOGRAM IN WITNESS-BOX

AT a general court martial last winter a soldier who had fired a rifle at a corporal pleaded that he had no knowledge of the affair but had suffered a head injury a few hours before the alleged time of the incident. No-one had witnessed the injury, and there was little clinical evidence to support the plea, except that the attack was without motive, unpremeditated, and was followed by singularly apathetic behaviour. An electroencephalogram showed abnormal changes compatible wtih a head injury of the severity described by the prisoner, and the abnormalities subsided in a couple of weeks. This evidence was accepted and the man was discharged. On July 14, a man was tried at the Winchester Assizes for a singularly brutal and seemingly purposeless murder. The defence was that the act was committed in a period of postepileptic confusion. Expert medical opinion supported this view on the evidence available, some of which was tenuous. Evidence was produced that the man had an abnormal EEG and that the changes seen after over-breathing were epileptic in character. It was pointed out that although an absolute diagnosis of epilepsy could not be made on the EEG alone, since no subclinical attacks were seen, the presence of such a record in a man who had behaviour suspicious of epilepsy made that diagnosis very likely indeed. The prisoner was found guilty of murder but insane. A correspondent in the *Times* of Sept. 16 suggests that the verdict might well have been different if the EEG had not been before the court. Since these two cases, similar evidence has several times been called elsewhere, and it has been accepted in courts of law in the United States for some time past.

The electroencephalogram does not show characteristic changes in every case of epilepsy, and in only a minority of epileptics are true subclinical attacks seen. Furthermore the relatives of epileptics, themselves apparently normal, may show similar abnormalities,[1] and unstable people, including psychopaths,[2] criminal delinquents and even constitutionally predisposed neurotics,[3] are liable to have an abnormal EEG. HILL[4] has pointed out that since it may reasonably be assumed that a high proportion of murderers have unstable temperaments and are consequently likely to have an abnormal EEG, the value of the test is reduced, since a diagnosis of psychopathic personality is no defence in law. He therefore rightly urges the most conservative use of the method. It is true that the EEG provides proof positive of epilepsy in only a small proportion of epileptics, and that some have quite normal records, but in the cases cited it was used, and accepted by the court, as corroborative evidence. In clinical medicine it is rare, perhaps unknown, to find a test which is infallible, but this does not prevent these tests being used to add to clinical knowledge. In the court of law a final opinion as to fact is reached by question and answer in much the same way as in medicine, and in the end it is not an infallible opinion, but only one which may be accepted beyond all reasonable doubt. Thus radiology and serology, with all their pitfalls, are called to add to the sum total of knowledge which is used to achieve justice. The limitations of the EEG are sufficiently understood for it to be used in the same way. Its sphere of usefulness includes behaviour disturbances of all sorts, the epilepsies and the abnormal states which accompany them, as well as the less clear cut disorders of psychopathic adults and delinquent children,[5] and of psychotics. It has been accepted as corroborative evidence of a head injury, and no doubt will often be used in compensation cases. Now that it has been shown to have forensic value, its application should be guarded, lest it be abused. There are few instruments in the country, and still fewer operators competent to give an opinion in a court of law. Given the apparatus it is easy to obtain a record, and one who gives an opinion has few to criticise him, so that the method presents a fertile field for the unscrupulous. Knowledge of the clinical interpretation of results is advancing steadily, and the method is now incorporated into the routine investigation of several disorders, but until recently it has been used mainly for research purposes, and has been absorbed into the clinical sphere with commendable discretion. Now that it has been brought to the public notice in courts of law steps should be taken to safeguard its use.

It is perhaps an over-simplification to suggest that men have been hanged for the lack of an EEG. Insanity for the purpose of determining criminal responsibility in an assize-court is notoriously different from insanity as seen and studied by the medical man. Many people are convicted of murder whom medical witnesses regard as insane. The official statistics, however, provide material for believing that defences of insanity which fail to avert a conviction for murder are nevertheless often sufficient to save a man from capital punishment. The trial of Ronald True in 1922 for the murder of Gertrude Yates illustrated the sharp division between the legal and the medical standard. True was convicted of murder but, after further medical inquiry, was respited and sent to Broadmoor. The law-courts accept the fact that epileptic murderers are known to medical science. The symptoms of epilepsy in the case of True were slight—little more than sudden lapses in conversation and memory. NORWOOD EAST, giving evidence on his behalf, explained the two kinds of epilepsy from which True might have suffered—epileptic mania or fury, a wild condition of excitement lasting a short time and leaving no recollection of what had happened, and epileptic automatism where also the patient would have no subsequent recollection. Mr. Justice MCCARDIE put the point carefully to the jury. If True killed Gertrude Yates while in an actual epileptic seizure, then, even though he knew the physical nature of the act and also that it was morally wrong and punishable by law, the jury ought to return the verdict of "guilty but insane." True's mental instability was ascribed to other causes than epilepsy. Here an EEG might have thrown light on the diagnosis, but the real obstacle in all these cases is that the machine may contribute proof of a specific dysrhythmia from which conclusions may be drawn, but it cannot tell the jury the state of a man's mind at a particular moment in the past. It does not prove sanity or insanity for the purposes of judge and jury. By itself it cannot establish automatism on some past date; it cannot declare a man's consciousness or intentions at some moment two months ago. That missing evidence is what the courts require.

1. Lennox, W. G., Gibbs, E. L. and Gibbs, F. A. *Arch. Neurol. Psychiat.* 1940, **44**, 1155.
2. Hill, D. and Watterson, D. *J. Neurol. Psychiat.* 1942, **5**, 47.
3. Williams, D. *Ibid*, 1941, **4**, 257.
4. *Times*, Sept. 25, 1942.
5. Jasper, H. H., Solomon, P. and Bradley, A. *Amer. J. Psychiat.* 1938, **95**, 641.

Annotations

DOSAGE OF VITAMIN D

THERE is no certainty about how much vitamin D children need. A League of Nations commission in 1938 put the requirements of infants at 400–500 IU daily, and President Roosevelt's National Nutrition Conference last year endorsed a figure of 400–800 IU daily for either infants or children up to 15 years, but higher estimates have been made. A subcommittee of the British Pædiatric Association, consisting of Dr. Wilfred Sheldon, Dr. Charles Harris, Prof. Noah Morris and Dr. Helen Mackay, have summarised present views and tried to establish some working instructions for mothers. They say that although a daily intake of 500 IU would probably protect most full-term infants and young children from rickets a daily allowance of 700 IU would give a wider margin of safety. The cod-liver oil compound now supplied by the Government for children under 5 years contains "not less than 100 IU of vitamin D per gramme," and the dose recommended rises from half a teaspoonful for babies under 6 months to a teaspoonful, thus providing some 200–400 IU daily, a dosage which the subcommittee consider inadequate. They also disagree with the advice to give babies under 6 months less than older babies, for the incidence of rickets is as great under as over 6 months, and in view of the more active growth in the earlier months the prophylactic requirement of vitamin D is greater then. They advise that vitaminised oil for distribution to children should be reinforced with irradiated ergosterol so that a teaspoonful will contain the daily allowance of 700 IU, as well as the present 3500 IU of vitamin A. Mothers should then be told to begin by giving the baby a few drops of this oil daily when a month old, and work up to a teaspoonful daily in a fortnight. This applies whether the baby is on breast or bottle. The premature infant (birth-weight under 5½ lb.) requires something like twice as much vitamin D as the full-time infant, so that the mother should give these underweights two teaspoonfuls of the oil, or 1400 IU daily, divided into four equal doses; this should be continued summer and winter. Babies whose birth-weight was over 5½ lb. need not be given vitamin D in summer provided they are suitably exposed to sun and skyshine for at least four hours daily. The subcommittee advise the same dose of 700 IU daily for older children on a mixed diet, dropping to 3500 IU a week at school age, when it might be issued with the school milk or school dinners. Pregnant and nursing mothers should also receive a supplement of 700 IU daily, and this will not take the place of the supplement for breast-fed babies. Finally, the subcommittee suggest that for the information of doctors the composition and vitamin content of cod-liver oil compound should be given on the label; they might have added that a similar statement should appear on all vitamin preparations.

CONTROL OF THE TYPHOID CARRIER

THE chronic carrier is the most important factor in the maintenance of endemic typhoid and paratyphoid infection and is often the source of epidemic outbreaks. Typhoid, though now rare in this country, is still responsible for much morbidity and mortality in America and in many subtropical countries; here it is being supplanted by paratyphoid, of which there has been an increased prevalence in recent years and often in a form so mild or atypical as to be clinically unrecognisable. The control or cure of the carrier is therefore essential if these diseases are to be eradicated. After an acute attack of typhoid or paratyphoid, many patients continue to excrete the pathogen for weeks after they are clinically well. Persistent convalescent and chronic carriers are most often elderly married women—for example, in the 1941 Liverpool outbreak,[1] of 16 (out of 339) cases who continued to excrete the paratyphoid bacillus for more than 16 weeks after infection, one was a man aged 52, 2 were young children and 13 were women, 9 of them over 40 years of age. A carrier is arbitrarily classified as a chronic carrier if excretion continues for more than a year, and it is estimated that 2–4% of clinical cases become chronic carriers, but a chronic carrier state may develop in a person who has never had a clinical attack.

The gall-bladder is the focus of infection in most enteric carriers, and cholecystectomy has so far been the only reliable method of cure. In two collected series,[2 3] 75% and 77% of the operated cases were permanently cured, and no doubt these results could be bettered. It is important to know that cure may result though the patient goes on excreting the pathogen by drainage-tube or in fæces for weeks or even months after cholecystectomy. But even with improved surgery and anæsthesia the operative risk on a stout, elderly woman is not negligible, and of course many carriers will refuse the operation, so that alternative methods of control or cure must be sought. The carrier can by law be forbidden employment in any trade or business concerned with the preparation or handling of food or drink for human consumption, but apart from this legal restriction, plus education in personal hygiene, control is not easy, and the carrier, as in the famous case of Typhoid Mary,[4] may readily evade the restriction. Isolation, except in institutional cases, is not permissible in England, although in Scotland the local authority has the power to deal with a person adjudged to be a carrier of an infectious disease as though the person actually suffered from the infection.

While many carriers remain apparently well, some have the symptoms of gall-bladder disease, and most of them, if untreated, experience a sense of contamination which has sometimes led to mental breakdown. Any *medical* treatment, therefore, which offered any prospect of cure would be welcomed by these sufferers. In the past such treatments as chemotherapy, physiotherapy, bacteriophage, vaccines and alteration of the intestinal flora have consistently failed to cure.[2] Lately various sulphonamides (sulphapyridine,[5] sulphasuxidine,[6] sulphaguanidine and sulphadiazine [7]), and mepacrine [8] have been tried without success, but claims have been made for the soluble tetraiodophthalein which is used for X-ray visualisation of the gall-bladder. In the United States Saphir, Baer and Plotke [9] treated 65 biliary carriers in a mental institution with intensive dosage of iodophthalein; they gave 4 g. doses by mouth three times a week with the patients on a low fat diet, the drug being taken in the morning so as to get maximum concentration and retention in the gall-bladder during the night. There were no ill effects, apart from some nausea and occasional diarrhœa. Of the 65 treated patients, 21 (32·3%) gave three consecutive negative cultures of duodenal contents but in only 5 of them did the stools become persistently negative. It seems unlikely that the remaining 16 cases had intestinal foci in addition to that in the gall-bladder; more likely duodenal aspiration was failing to recover gall-bladder bile. It is significant that in the cured cases visualisation of the gall-bladder was good, and attempts at cure by this or allied substances probably require a gall-bladder in which the drug will be retained

1. Holt, H. D., Vaughan, A. C. T. and Wright, H. D. *Lancet*, 1942, i, 133.
2. Browning, C. H. et al. *Spec. Rep. Ser. med. Res. Coun., Lond.* 1933, No. 179.
3. Golla, F., McGrath, M. J. and Ashby, W. R. *J. ment. Sci.* 1936, **82**, 263.
4. Soper, G. A. *Bull. N.Y. Acad. Med.* 1939, **15**, 698.
5. Holt, H. D. and Wright, H. D. *J. Path. Bact.* 1942, **54**, 247.
6. Kirby, W. M. M. and Rantz, L. A. *J. Amer. med. Ass.* 1942, **119**, 615.
7. Cutting, W. C. and Robson, G. B. *Ibid*, 1942, **118**, 1447.
8. *Mon. Bull. emerg. publ. Hlth Lab. Serv.* September, 1942, p. 6.
9. Saphir, W., Baer, W. H. and Plotke, F. J. *Amer. med. Ass.* 1942, **118**, 964.

and concentrated. Although the results obtained by Saphir have not been confirmed by other workers, they are sufficiently encouraging to warrant further research along this line. It is suggested that for elderly patients iodophthalein should always be tried before surgical intervention, and the drug might be useful in hastening cure of the convalescent carrier.

SOAP FOR THE CUT HAND

THIS is a war of production and with our limited manpower any wastage due to the minor injury is serious. According to Stewart,[1] over 11% and probably up to 20% of minor injuries in which compensation for over 3 days incapacity has to be paid are due to sepsis. In a consecutive series of 1000 cases that attended a factory surgery over half came because of hand injuries. The treatment of such injuries is often unsatisfactory and usually consists of a perfunctory iodine dab without preliminary cleaning. Kerrigan,[2] aware of the obvious soiling of the workman's hand, 5 years ago started using soap and water only for cleaning such wounds. Writing of his experience in Michigan City, a big lumber centre, he assures us that not a single case out of 9195 compound hand injuries where attention was given within the first few hours required admission to hospital; the 10 cases which were admitted first attended one or more days after the accident. Some cases did develop minor infection but with suitable splintage all were able to continue at their work under careful observation. Kerrigan prefers a neutral white soap which is applied with cotton-wool swabs and also uses benzene or ether to clean the surrounding stained greased skin of the workman. But he points out that for the severe injury careful wound excision is still absolutely necessary. In this series no sulphonamides or other forms of chemotherapy were employed. A neutral soap is not essential, and indeed Colebrook [3] has shown that yellow household soap has a bactericidal power superior to refined soap. This bactericidal power is greater in warm water, and 5 minutes washing in 3 or 4 pints of water will destroy most of the pathogens commonly met with in sepsis. Early attention to the cut hand by soap soaks and washing should be taught to the factory staff. The bandage soiled at work later forms a path for infection, so there is still need for some waterproof cover if the workman is to go on with his job, and the best form of rehabilitation treatment for the injured hand is often a man's ordinary work.

THE STREPTOCOCCUS IN ACUTE RHEUMATISM

SINCE the pioneer researches of Poynton and Paine at the beginning of the century, the part played by streptococci in the ætiology of acute rheumatism has developed into a major problem. Much of the earlier work had for its object the isolation of microbes from the fluids or tissues of cases of acute rheumatism, and on the infrequent occasions that cultures were obtained they were mostly of non-hæmolytic streptococci, particularly *Streptococcus viridans*; these organisms were therefore formerly regarded as the most likely candidates for the ætiological rôle. During the past ten years, however, largely as a result of the epidemiological studies of Coburn, hæmolytic streptococci have seemed increasingly important. The application to this field of the refinements in bacteriological technique introduced by Todd, Lancefield and Griffith has resulted in an extensive literature which has recently been surveyed by Green.[4] Bacteriological studies have demonstrated an epidemiological relationship between hæmolytic streptococcal infection of the throat and the incidence of acute rheumatism. Apart from clinical infections, a high carrier-rate for hæmolytic streptococci has also been observed in rheumatic subjects; thus Green found group A streptococci in 50·5% of rheumatic throats compared with 12·5% of the throats of normal controls. In individual cases of rheumatic fever, too, relapse is often accompanied by the reappearance or an increase in the numbers of hæmolytic streptococci in the throat. The proportion of individuals displaying skin sensitivity to the injection of streptococcal extracts has been found to be considerably higher in rheumatic subjects than in normal controls. Green found while this sensitivity was not specific for any one kind of streptococcus it occurred more often when the extracts were from hæmolytic streptococci. It should be noted that these observations apply to extracts of bacterial bodies—"endotoxins"—and not to streptococcal exotoxins. Since the demonstration by Todd of the antigenic nature of streptococcal hæmolysin and of the practicability of measuring the corresponding antibody titre in human serum, it has been established that these antistreptolysin titres show a well-marked rise after infections with hæmolytic streptococci. Several workers have found that antistreptolysin titres are also significantly raised in many cases of acute rheumatism. Green points out however that recrudescence of the disease does not necessarily result in further increase in titre. While attempts to isolate hæmolytic streptococci from joint fluids have been seldom successful, Green recovered these organisms from the heart valves at autopsy in 8 of 9 cases of acute rheumatic carditis. Thomson and Innes repeating this work were also successful in 5 cases out of 10. Green considers that the available data support Coburn's contention that the rheumatic state results from an abnormal response to a hæmolytic streptococcal infection leading to sensitisation of the tissues; on coming into contact with further supplies of the antigen the sensitised tissue may then react by producing the characteristic lesions of rheumatic fever. Recent work also lends support to the view that heredity is an important predisposing factor.

MECHANICAL CONTROL OF COLOSTOMIES

MANY ingenious operations have been devised to give mechanical control of the bowel in cases of permanent colostomy. These have included the use of specially designed obturators, the fashioning of the artificial anus in such a way that the stoma finally becomes very small and can be corked; insertion of the proximal limb of the colon through a specially constructed muscular ring, and implantation of this limb through a subcutaneous tunnel. None of these has been popular in England, though they are practised in France, Italy, Germany and some Latin-American countries. R. B. Gonzalez of Venezuela [1] has modified Cunéo's [2] operation, and reports favourable results in 21 out of 26 cases. His aim was to secure true continence and not merely regularity of the bowel by means of dieting and colonic lavage. In his operation the exteriorised functioning limb of intestine is closed by a compression device. Two parallel horizontal incisions are made in the left iliac fossa and carried down to the external oblique aponeurosis; the oblong area of skin thus outlined is made into a tube by stitching the two edges to one another. The upper edge of the wound is undermined and the peritoneum is exposed and opened. A loop of sigmoid is drawn through the wound and divided with a cautery between two enterotomes; the lower end is invaginated and returned to the abdomen. The peritoneum is sutured round the upper limb of colon and the muscular layers are closed round it without compression. The limb of bowel is then carried across the skin tunnel, and brought out through the lower flap of the original wound. The upper and lower skin flaps are then united in a bridge over the limb of colon, which thus lies between the skin

1. Stewart, D., British Orthopædic Association annual meeting at Nottingham on Sept. 23, 1942.
2. Kerrigan, R. L. *Surg. Gynec. Obstet.* 1942, **75**, 165.
3. Colebrook, L. *Bull. War Med.* 1941, **2**, 73.
4. Green, C. A. *Ann. rheum. Dis.* 1942, **3**, 1.

1. *J. int. Coll. Surg.* 1942, **5**, 141. 2. *Pr. méd.* 1922, **30**, 333.

superficially and the skin tunnel deeply. The cut end of the bowel, still secured by a clamp, is fixed by a few sutures to the small circular skin incision; the clamp is left on for 24–48 hours, and when it is removed pains are taken to avoid soiling the wound by fixing rubber sheeting around it. When all is healed the compression device, a special forceps shaped somewhat like a safety-pin, can be used. One arm of this is passed beneath the bowel through the skin tunnel and the other above it, the two arms being fastened together, by means of a bolt and nut, tightly enough to maintain continence without producing pressure necrosis of the entrapped portion of bowel. Dilators are used for some weeks after operation to keep the skin tunnel from contracting unduly. Of Gonzalez's 26 patients, 1 died from peritonitis, 2 developed pressure gangrene of the loop and lost the skin tunnel, 2 had a fairly severe ventral hernia, and in the remainder the result was apparently satisfactory. The operation shows great ingenuity, and is comparatively easy to perform; but it obviously cannot be done if there is much stenosis of the rectum or lower sigmoid, because the invaginated loop of bowel distends and may rupture; it is contra-indicated in carcinoma of the rectum or lower reaches of the sigmoid; nor is it suitable, as Gonzalez himself points out, in cases of diverticulitis because the sigmoid is often fibrotic; and it is too long an operation to be borne by any patient who is seriously ill. Again, results may be complicated by peritonitis, infection of the wound, distortion or stenosis of the tunnel, ventral hernia or cellulitis; and finally unless the safety-pin device is adjusted by an intelligent person the compressed portion of the gut may become œdematous or even gangrenous. In England, then, indications for this operation are very limited. Gonzalez operated chiefly on cases with lymphogranuloma venereum of the rectum or lower sigmoid, and for such patients it may have a place. The condition is rare in Britain, but in any case most surgeons here would probably prefer to treat it palliatively with graduated rectal dilatation, mild local disinfectants and sulphathiazole both locally and by mouth. If colostomy was necessary probably most would favour loop colostomy, or the defunctioning type of colostomy devised by Devine.

LIVER NECROSIS AFTER BURNS

NECESSITY, the mother of invention, is sometimes too importunate in her choice of mate to be critical, the offspring may then develop blemishes that betray the hasty marriage. The therapeutic problem of burns was immense; when therefore tannic acid treatment was first introduced by Davidson in 1925 and the immediately satisfactory results had been widely confirmed there was little room for criticism. Later critics have in general confined themselves to saying that tannic acid should not be used on this or that part of the body, or that better tanning was produced by other agents such as silver nitrate or triple dye or by combinations with antiseptics and bacteriostatics. Only of late, with the general reawakening of interest in the investigation and treatment of injuries, have the effects of tannic acid treatment been more closely re-examined. The fact that liver necrosis in burns [1] has become widely recognised only since tannic acid therapy was introduced might be related merely to the longer survival of severely injured patients. The majority of such used to die from plasma loss on the first day, but surface coagulation and serum transfusion have considerably decreased the mortality from this cause. That the liver necrosis might to due to therapy is an alternative possibility. It seems unlikely that the plasma or serum would be to blame, since the infective jaundice recently found to be transmitted by serum (whether given for mumps, for yellow fever prophylaxis or for other reasons) has an incubation period of several weeks. The remaining possibility, that the liver damage might be due to tannic acid, has been investigated by Wells, Humphrey and Coll.[2] They detail and illustrate well-marked liver damage in rats, rabbits and guineapigs after subcutaneous injection of tannic acid. The damage was proportional to the amount injected. These results, if confirmed, would not necessarily mean the abandonment of what has proved a highly effective mode of treatment, but they would call for an attempt either to inhibit this harmful effect or to find some other coagulative agent with less undesirable side actions.

1. Wilson, W. C., MacGregor, A. R. and Stewart, C. P. *Brit. J. Surg.* 1938, **25**, 826.

IMPACTION OF THE EPIGLOTTIS

LATELY Caiger [3] of Durban, South Africa, has drawn attention to the possibility that impaction of the epiglottis in the larynx may obstruct breathing during anæsthesia. Caiger's view is that if muscular relaxation allows the epiglottis to fall back sufficiently for the inspired air to impinge on its anterior surface the air may force the free part of the epiglottis through the glottis. He has met with half a dozen cases of such impaction, and has relieved it by drawing the tongue forward and lifting the epiglottis with the finger; on one occasion disimpaction produced an audible click. The fact that this impaction cannot be produced or demonstrated after death is no certain proof that it does not arise during life, but the size, consistency and position of the normal epiglottis make it difficult to imagine its being blown or sucked into the larynx; for this to happen the epiglottis would have to be unduly pliable. Certainly this is not a common cause of obstruction. The usual causes of obstructed breathing are well recognised and readily relieved when treated promptly. Caiger, however, suggests that swabbing out the pharynx, drawing forward the tongue and artificial respiration may all be effective sometimes because they release an unsuspected impaction. His contention that impaction may have been the cause of a considerable proportion of unexplained anæsthetic deaths is unconvincing, for most records of such deaths expressly state that there was no obstruction to breathing. All the same, Caiger's suggestion may lead anæsthetists to study with enhanced interest the exact arrangement of the upper air-passages when next they meet with obstructed breathing in anæsthesia.

2. Wells, D. B., Humphrey, H. D. and Coll, J. J. *New Engl. J. Med.* 1942, **226**, 629. 3. Caiger, G. H. *J. Laryng.* 1942, **57**, 250.

Sir HENRY DALE, PRS, has accepted the directorship of the laboratories of the Royal Institution, with the Fullerian professorship, in succession to the late Sir William Bragg. His appointment is, at his own request, limited to a period of three years, so that the managers may then be free to consider future policy.

Dr. ARTHUR ELLIS has been appointed regius professor of medicine in the University of Oxford in succession to Sir Farquhar Buzzard, who is retiring. Dr. Ellis was director of the medical unit at the London Hospital and held a chair of medicine in the University of London until his appointment six months ago to the scientific staff of the MRC as director of research in industrial medicine.

Sir HUGH LETT will deliver the second Moynihan lecture at the University of Leeds on Thursday, Oct. 29, at 3 PM. He will speak on William Hey and after.

Next Tuesday will be available the 21 monographs on the *Control of the Common Fevers* which have been arranged for publication with the help of Dr. Robert Cruickshank. The unwelcome delay has at all events had the compensating gain of making it possible to include chapters by writers who were then on active service abroad. While the book is based on a series of articles which have already appeared in our columns and have been widely appreciated, these have been revised or rewritten and nearly as many others added. Particulars will be found on our front cover.

Special Articles

TUBERCULOSIS IN YOUNG ADULTS

A PRELIMINARY ANALYSIS OF THE PROPHIT SURVEY

F. RIDEHALGH, M B CAMB

PROPHIT SCHOLAR RCP 1934–40; DEPUTY CLINICAL TUBERCULOSIS OFFICER, LEEDS

IN 1934 the Royal College of Physicians of London inaugurated under the terms of the Prophit Bequest a survey scheme with the following objects:

1. To determine the level of tuberculous infection by the graduated Mantoux tuberculin test.
2. To correlate the results of the Mantoux test with the results of X-ray examination of the thorax.
3. To determine the value of mass X-ray examination as a means of revealing unsuspected pulmonary tuberculosis.
4. To assess the possible prognostic significance of the Mantoux test.
5. To discover the existence and importance of opportunities for primary tuberculous infection in the population studied.
6. To determine the significance of certain abnormal appearances in the chest X ray which are not yet fully understood.

This paper is a record of the investigation so far as it was completed in the five years immediately before the outbreak of war and is summarised from a detailed report presented to the College. All the statistics have been checked by an expert.

METHODS OF THE SURVEY

The persons studied are mostly between the ages of 15 and 25. A few children between 12 and 14 are included and a very few adults between 26 and 30. They are divided into five groups: (1) "Volunteer controls"—a group of apparently normal healthy office and factory workers; (2) Contacts of cases of pulmonary tuberculosis; (3) Nurses; (4) Medical students; (5) Boys entering Royal Naval training establishments. A full medical and family history was taken, with details of occupation, hours of work, time of travel to work, principal recreations, place of birth, other places of residence with dates, racial history of parents (English, Scots, Irish, Welsh, Jewish), size of house, size of household with ages, and known contact with tuberculosis. This information was given directly or by questionnaire as was convenient. Physical examination was normally done only on contacts or if certain abnormal X-ray findings were present.

The tuberculin used for the Mantoux test was the International Standard synthetic medium old tuberculin supplied by the Medical Research Council,[1] dilutions in boric acid-borate buffer [2] being made monthly from one batch of tuberculin. The initial test with 1 : 10,000 tuberculin was read after 48–72 hours and repeated with dilutions up to 1 : 100 if necessary. Erythema alone was recorded as a "doubtful" reaction, the minimum "positive" reaction being taken as 2 mm. of definite œdema with surrounding erythema. With the exception of 69 contacts all tuberculin tests referred to below were performed and read by the writer.

Full-size X-ray films were used throughout. Most volunteer controls were X rayed by Mr. Ferrier, who used the mobile X-ray unit of the Joint Red Cross.[3] For contacts the ordinary X-ray arrangements of the dispensary were used. In all other cases the X rays were done by the appropriate hospital or medical school. Despite these diverse sources practically every X ray was of good diagnostic quality. All films were interpreted by the same committee of radiological consultants appointed by the College.

The Mantoux test and the chest X ray were normally repeated annually on each person in the survey to a maximum of five examinations. There was a considerable loss of volunteers in every group, postal follow-up being used to maintain contact so far as possible.

Volunteer Control Group

704 males and 839 females aged 15–30 were examined in this group. They include employees of insurance and other offices, gas companies, the central departments of the Post Office, and other office and factory workers. The proportion of factory workers is small. That this control group is not representative of London's average population is shown by the very small proportion coming from overcrowded homes, only three of the families being housed at 2 or more per room.

Of the males 5·1% gave a negative Mantoux reaction at the first examination, compared with 9·5% of females, and 85·8% reacted to 1 : 10,000 tuberculin, compared with 80%. These sex differences are statistically significant and indicate an excess of positive reaction among the males, which was found also when comparison was made between separate 3-year age-groups.

Of the 110 persons, included in the control group, who had migrated to London from the country within ten years of the examination, 18% gave a negative Mantoux reaction compared with 7% of those who had lived in the Greater London area for ten years or more, a significant excess.

The median level of housing in this group came at the low level of 1·2 persons per room. Using this value as dividing line, no evidence was found that the group living at higher densities than this included any larger proportion of positive reactors than the group living at lower densities, but rather the reverse.

Radiological lesions suggestive of "adult" pulmonary tuberculosis were found in 13 (0·84%) of the 1543 at the first examination, only 2 (0·13%) of these requiring treatment and only 1 having clinical symptoms of the disease. Radiological evidence of healed primary infection—that is to say, calcified lung foci, calcified tracheobronchial glands, or both—was found in 110 (or 7·2%) and of these only 2% gave a negative Mantoux reaction compared with 8% of the radiologically normal, and 91% reacted to 1 : 10,000 tuberculin compared with 82% of the radiologically normal. Among all positive reactors 5·6% of males showed calcified lesions compared with 9·4% of females, a statistically valid difference. No conclusive evidence of any association between the incidence of calcified lesions and age was found.

The general distribution of Mantoux reactions in 1045 persons in the control group when re-examined after one year was not much different from the distribution at the first examination, though a slight movement towards the positive end of the scale had occurred. Among the males who had lived in Greater London for 10 years or more an increase in tuberculin sensitivity

TABLE I—MANTOUX REACTIONS AT FIRST EXAMINATION

Group		No. examined	MTT + in dilution of 1 : 10,000 ** (%)	1 : 10,000 * (%)	1 : 1000 (%)	1 : 100 (%)	MTT ± (%)	MTT − (%)
Controls	M	704	64 (9·0)	540 (76·8)	23 (3·2)	34 (4·8)	7 (1·1)	36 (5·1)
	F	839	69 (8·2)	601 (71·8)	44 (5·3)	29 (3·4)	15 (1·8)	80 (9·5)
	P	1543	133 (8·6)	114 (74·1)	68 (4·3)	63 (4·2)	22 (1·4)	116 (7·5)
Contacts	M	379	56 (14·8)	282 (74·4)	18 (4·8)	9 (2·4)	4 (1·0)	10 (2·6)
	F	405	52 (12·8)	297 (73·3)	21 (5·2)	16 (4·0)	5 (1·2)	14 (3·5)
	P	784	108 (13·8)	579 (73·9)	39 (5·0)	25 (3·2)	9 (1·1)	24 (3·0)
Hospital nurses—Voluntary	F	953	87 (9·1)	482 (50·7)	105 (11·0)	134 (14·0)	35 (3·7)	110 (11·5)
Municipal	F	523	60 (11·4)	229 (43·8)	37 (7·1)	73 (14·0)	31 (5·9)	93 (17·8)
Medical students	M	1106	106 (9·6)	627 (56·7)	102 (9·2)	109 (9·9)	38 (3·4)	124 (11·2)
	F	141	16 (11·4)	65 (46·1)	14 (9·9)	19 (13·5)	4 (2·8)	23 (16·3)
Boys in naval training—Estab. I	M	796	34 (4·3)	232 (29·1)	77 (9·7)	153 (19·3)	29 (3·6)	271 (34·0)
Estab. II		122	10 (8·2)	48 (39·4)	7 (5·7)	24 (19·7)	7 (5·7)	26 (21·3)

MTT = Mantoux tuberculin test.
Reaction ** to 1 : 10,000 tuberculin is one with a disc of œdema 20 mm. or more across. The single asterisk denotes any reaction less than this.

1. Douglas, S. R. and Hartley, P. *Tubercle, Lond.* 1934, **16**, 105–113.
2. Glenny, A. T., Pope, C. G. and Waddington, H. *J. Path. Bact.* 1938, **31**, 133.
3. Ferrier, H. T. *Brit. J. Radiol.* 1934, **7**, 426.

was noted in 17–19% according to age and a decrease in 4–8%, only 1 initially positive reactor becoming negative. Among the females an increase in sensitivity was noted in 15–16% according to age, and a decrease in 14–16%, 14 initially positive reactors becoming negative. Re-examination after 2 and 3 years showed similar results. The number of migrants from the country who were re-examined was not large enough to form any conclusion as to change in sensitivity.

Tuberculosis Contacts

The term " contact " is here taken to mean a person who is or has been in contact, in his home, with a case of pulmonary tuberculosis (not necessarily sputum-positive) but who is not known to have himself suffered from clinical tuberculosis at the time of the first examination The infecting patient is almost invariably a parent or sibling of the contact, and in some instances has died before the first examination of the contact. Contacts aged 12 to 30 were collected by the tuberculosis officers and health visitors of ten metropolitan boroughs, selected only for their willingness to coöperate.

784 contacts, coming from 442 tuberculous families comprising 2349 persons were examined, 379 being males and 405 females. The examination and Mantoux tests on all except 69 of these were carried out by the Prophit scholar. In 69 cases the tests were done under standard conditions and with standard materials by the tuberculosis officer.

The districts from which they were drawn together formed a fair sample of London as a whole as regards housing and vital statistics. The contacts, when compared with the general population of London, showed a significant excess of families of 5 or more persons. There was, however, no significant difference between them and the London census population of 1931 as regards the proportion housed at 2 or more persons per room. For families of 4 persons there was no difference in the overcrowding rate, and in families of 5 or more persons the contacts appeared to be living in much less crowded conditions than the general population.

The proportion giving a negative Mantoux reaction at first examination was only 3·0%, and was significantly lower than among the volunteer control group for each sex, but the distribution of positive reactors according to the strength of the reaction did not differ significantly from the volunteer control group.

At the initial radiological examination 2·4% showed active pulmonary tuberculosis, 2·5% parenchymatous lesions considered to be quiescent, and 17·2% calcified lung nodules, calcified tracheobronchial glands or both. The incidence of healed primary lesions was not significantly different in separate 3-year age-groups of contacts.

TABLE II—PRINCIPAL RADIOLOGICAL FINDINGS AT FIRST EXAMINATION

Group	—	No. examined	Healed primary lesions (%)	Inactive pulmonary tuberculosis (%)	Active P.T. requiring treatment (%)
Controls	M	704	38 (5·4)	5 (0·8)	1 (0·14)
	F	839	72 (8·6)	6 (0·7)	1 (0·12)
	P	1543	110 (7·2)	11 (0·71)	2 (0·13)
Contacts	M	379	58 (15·3)	8 (2·1)	7 (1·8)
	F	405	77 (19·0)	12 (3·0)	12 (3·0)
	P	784	135 (17·2)	20 (2·5)	19 (2·4)
Hospital nurses—					
Voluntary ..	F	953	57 (5·9)	4 (0·4)	0 ..
Municipal ..	F	523	41 (7·8)	2 (0·4)	2 (0·4)
Medical students	M	1106	56 (5·1)	1 (0·09)	0 ..
	F	141	10 (7·1)	1 (0·7)	0 ..
Boys in naval training—					
Estab. I ..	M	796	39 (4·9)	0 ..	2 (0·25)
Estab. II ..	M	122	5 (4·0)	1 (0·8)	0 ..

Column 4: *Healed Primary Lesions* mean calcified nodules in lung, calcified hilar glands visible in X-ray film and present separately or together.

Column 5: *Inactive Pulmonary Tuberculosis* means tuberculous infiltration of lung parenchyma not found to require treatment at the time of diagnosis.

On re-examination of 253 contacts after the lapse of one year, an increase in sensitivity to tuberculin was noted in 22% compared with 17% in the control group, the excess being twice its standard error. A decrease in sensitivity was found in 9% compared with 11% in the control group.

The outstanding practical feature of the examination of contacts is the high incidence of active pulmonary tuberculosis revealed. No active lesions were found in the 180 contacts aged 12–14 nor were any healed parenchymatous lesions (as distinct from calcified nodules and glands) found in this subgroup. The incidence of active pulmonary tuberculosis in male and female contacts aged 15–30 was thus 2·4% and 3·9%, plus 2·7% and 3·9% respectively of healed parenchymatous lesions. The value of at least one X-ray film of adolescent and young adult contacts is thus clear, and it is hoped in a future communication to show that repeated annual X-ray examination is no less important.

Hospital Nurses

These were drawn from five large voluntary teaching hospitals and five large general hospitals under the control of a local authority. In nearly all cases the initial X-ray and Mantoux test were carried out while the probationer was still in the preliminary training school so that the figures give a fair picture of conditions at the start of training. The voluntary and municipal groups of hospitals differ in the degree of known contact with tuberculosis which they afford their nurses. The former admit pulmonary tuberculosis patients only in small numbers, either undiagnosed, or after acute emergencies such as hæmoptysis, or for teaching purposes. The municipal hospitals, up to the outbreak of war, practically all had large tuberculosis wards acting as reservoirs for the sanatoria and as asylums for advanced and dying cases.

953 nurses in voluntary hospitals were examined, of whom 63·2% were English, 7·7% were Irish, 5·3% Welsh, 3·1% Scots and 20·7% of mixed parentage. 523 nurses in municipal hospitals were examined, of whom 43·6% were English, 33·1% were Irish, 10·7% Welsh, 4·4% Scots and 8·2% of mixed parentage. There was considerable excess of Irish and Welsh in the municipal group compared with the voluntary hospital group.

Of the entrants to voluntary hospitals 11·5% gave a negative Mantoux reaction when first tested, the proportions not being significantly different from those for the female control group of the same ages. Of the entrants to municipal hospitals 17·8% were Mantoux negative when first tested, a significantly higher proportion than among either the control group or the voluntary hospital nurses. In each group of nurses a lower proportion reacted to 1 : 10,000 tuberculin and a higher proportion to 1 : 1000 or 1 : 100 than amongst the control group, this being true at all ages and at ages 18–21.

Comparison of the Irish municipal hospital nurses with other nurses in the same hospitals revealed a significant excess of negative reactors, the rate being 25% in the Irish nurses. The other municipal hospital nurses included 14% with negative reactions compared with 9% among the control group, an excess very probably significant (2·6 times the standard error) and perhaps due to the higher proportion of Welsh and other than English nurses included.

The voluntary hospital nurses showed on radiological examination 5·9% with calcified lesions compared with 8·5% of the female control group, this difference being of doubtful significance. The municipal hospital nurses showed no difference from the control group in this respect. No case of active pulmonary tuberculosis was found in the group of voluntary hospital nurses, in which 0·4% of healed parenchymatous lung lesions was found. The municipal hospital nurses showed 0·4% of active tuberculosis and 0·4% of healed parenchymatous lesions.

The proportion of municipal hospital nurses initially negative to tuberculin who after a year in hospital gave a positive reaction was 78%, a significantly greater change than among voluntary hospital nurses (42%), or female controls (22%). Only 1 out of 156 initially positive reactors became negative instead of 4 expected from the control group. Doubtful reactors tended to become positive rather than negative after a year in hospital. Strongly positive reactions became weaker

less frequently than amongst the voluntary hospital nurses or controls, and weak positive reactions tended to become stronger more frequently in the municipal group. Only one nurse was found to remain negative to tuberculin after three years in a municipal hospital.

Medical Students

1247 preclinical medical students were examined, 1106 being males and 141 females. They were recruited from seven medical schools of the university of London and from three provincial universities. The methods of examination were the same as those used in all other groups and the initial Mantoux test and X ray were carried out in the preclinical period.

Male students at ages under 21, numbering 806, included 11·9% of negative Mantoux reactors compared with 5·6% among male controls of similar ages; male students of age 21 and over, numbering 300, included 9·3% of negative reactors compared with 3·2% among male controls of corresponding age. In each case the excess of negative reactors was 4 times the standard error and therefore significant. The proportion of reactors to 1 : 10,000 tuberculin were much below, and the proportion of reactors to 1 : 1000 were above the corresponding proportions in the male control group at both ages. The proportion of weak reactors (positive to 1 : 100 tuberculin) was above the control figure at ages under 21.

The comparison establishes the fact that preclinical male medical students are less often and less strongly tuberculin positive than London controls of similar age. This was also true of female medical students with respect to the strength of positive reaction and probably also with respect to the frequency of any kind of positive reaction.

No case of pulmonary tuberculosis requiring treatment was found at the first examination. The incidence of radiological lesions in males was otherwise similar to that in the control group at the same ages. Calcified "primary" lesions occurred in 4·7% and 6·1% respectively of students under and over age 21.

Re-examination after one year of 492 students initially positive to tuberculin showed an increase in sensitivity in 29% and a decrease in 13%, including 2% whose reactions became negative. Of 61 initially negative to tuberculin only 33 remained negative after a year, and of 38 retested after two years 15 remained negative. The proportion registering an increase in sensitivity was significantly greater than amongst male controls coming from towns (14%), but was the same as that found amongst voluntary hospital nurses.

Boys in Naval Training

Two Royal Naval training establishments were included in the survey. The first gave a period of about one year's general training to a comparatively large number of boys, the second a period of about four years training in engineering subjects to a relatively small number of boys selected by competitive examination. 796 boys aged 15–16 entering the first and 122 entering the second establishment were examined. Of the former group 32% came from the country or from small towns of less than 8000 population.

In the first establishment the proportion of Mantoux negative reactors was 34%. Of those coming from the country or from small towns 40% were Mantoux negative, of those from larger towns 31% were Mantoux negative. Boys entering the second establishment showed 21·3% of negative reactors. A group of 66 London boy controls of similar age showed 12% of negative reactors.

The frequency of radiological lesions was not significantly different from that in the small London control group. No tendency for tuberculin sensitivity to increase in any way comparable with that found in the hospital groups was found on re-examination after one year.

In relation to the rest of the survey, this group of boys is chiefly of interest in so far as it gives an idea of the apparently much lower level of tuberculin sensitivity (and presumably of tuberculous infection) existing in rural districts as compared with London.

* * *

The routine work of the survey was stopped during the period of disorganisation immediately after the outbreak of war and was resumed in March, 1940, with certain unavoidable modifications. Work on the volunteer control group has become almost impossible since many volunteers have been transferred to districts remote from London while many others have joined the Services. Alterations in the working hours of tuberculosis dispensaries have seriously interfered with the examination of contacts. Changes in the distribution of medical students have increased the difficulties of routine work in this group, although examinations are being continued so far as possible.

Reorganisation of the London hospitals has abolished the clear distinction between nurses in voluntary hospitals and those in municipal hospitals. The value of the survey in this group has, however, become more widely recognised and opportunities for expansion have been offered far in advance of those available before the war. A large increase has already taken place in the number of nurses under observation and results obtained so far suggest that the survey may eventually add substantially to our knowledge of the epidemiology of tuberculosis among nurses.

Wherever full re-examination is impossible the attempt to maintain contact with volunteers through a postal follow-up is being continued.

RADIOLOGICAL CHANGES DURING OBSERVATION

One of the most important parts of the survey is the assessment of the rate at which pulmonary tuberculosis develops in the different groups of persons originally free from the disease, and of the factors which lead to the development of lesions. Between 1934 and 1939 many such cases were observed, especially in the contact group. These radiological changes were analysed in some detail in the original report, and figures were prepared showing the rate of development of pulmonary lesions per thousand person-years of observation in the various groups, in the period Sept. 1934 to Aug. 1939. During the first year of the war many more cases of phthisis were recorded and it became clear that more reliable conclusions would be reached by extending the period of observation. There was moreover an increasing suggestion of a useful correlation between the tuberculin reactions and the rate of development of tuberculous lesions. For this reason it was considered wise to defer publication of figures on these points until the position became clearer, and it is hoped to publish a further report later. One point is clear. In the contact group, after those suffering from pulmonary tuberculosis on first examination have been excluded, the remainder, originally free from disease, develop pulmonary tuberculosis at a steady rate which seems to lie between two and three per cent. per annum. The value of repeated annual review by X ray of contacts over age 15 and originally X-ray negative is thus very great, especially as the cases so discovered usually carry an excellent prognosis.

The organisation and field work of this survey could not be carried on without the help of many persons whom it is impossible to single out for individual thanks. I wish, however, to express my gratitude to the Prophit Tuberculosis Survey Committee of the Royal College of Physicians for their wise guidance and for permission to publish this summary.

SCOTLAND

HOSPITAL CONTRIBUTORY SCHEMES

THE British Hospitals Association with sassenach modesty disclaims any wish to interfere with purely Scottish affairs, but it has gently reminded the Scots that it might be unwise to assume that what concerns Scotland cannot in any circumstances concern the rest of Britain, and that coöperation between the Scottish and English bodies interested in the future of voluntary hospitals is important. At the annual meeting in Glasgow of the Scottish branch of the association the representatives agreed that they must stop swithering and make up their minds about contributory schemes, and Mr. J. D. Wyllie of Kilmarnock moved a resolution in favour of their institution and suggested consultation between the different interests involved with a view to setting up reciprocal and, as far as possible, uniform schemes. Scotland's experience of them has so far been limited but successful and Mr. Wyllie pointed out that

an extension of national health insurance to include hospital treatment as a statutory benefit would mean their death. He thought also that the independence of the hospitals would be affected if the money came from the state, while contributory schemes did not affect hospital self-government nor risk losing voluntary donations. Dr. David McKail of Glasgow protested that the people of Scotland were unfamiliar with the details of these schemes and he objected to being rushed. He did not see how they could escape from a whole-time service with adequately paid medical officers. The resolution was, however, approved by a large majority.

PROFITING BY EXPERIENCE

Our two chief protections against ship-borne smallpox are vaccination and the surveillance of passengers and crew where a case has occurred. War conditions have increased the risk and have made the surveillance of suspects more difficult, and Sir Alexander Macgregor in his report of the recent Glasgow epidemic thinks that the lesson we should learn from it is the adoption of immigrant vaccination as a routine precaution. The story of the Glasgow epidemic, he points out, would probably have been different if all susceptible members of the crew and passengers had been quietly vaccinated when the ship left Bombay—a port which was known to be infected. Sir Alexander draws a striking parallel with the epidemic of 1929 when the ss. *Tuscania* landed a confluent case of smallpox at Marseilles and 13 of the crew and a considerable number of the passengers contracted the disease in this country. After this hint the shipping companies trading with the East wisely took the precaution of paying stricter attention to the vaccination of their crews with such good results that it was possible to close the Glasgow smallpox hospital with the exception of two wards reserved for emergencies. Today it is imperative that we should do everything to prevent the access of infection to this country and Sir Alexander accordingly urges that vaccination should be made a condition of travel for all passengers sailing to this country from eastern ports who have not been recently protected. He is confident that members of the Merchant Navy would be willing to be vaccinated from time to time if the reason for the precaution was explained to them.

RUSSIAN CONFERENCE

THE Institute of Experimental Medicine of the USSR met recently to discuss some of the practical and immediate scientific problems which have for the time superseded more theoretical studies. A report of their discussion, cabled to this country by Professor GRASHCHENKOV of the Moscow Neurological Clinic, is full of stimulating information but is tantalising too, because it was naturally impossible in a cable to go into detail about the many promising lines of research now being pursued by Russian scientists. He reports that in the past six months the clinic, working in collaboration with a mobile field hospital specially staffed and equipped for neurological work, had treated 600 compound wounds of the head. Workers there have been much impressed with the value of sulphonamides, and have used sulphanilamide, sulphapyridine and sulphathiazole in proportions varying with the organisms found on wound culture. Professor LURIA, at a branch clinic of the institute, is studying the treatment of aphasia and other focal brain lesions. Professor KUPALOV, a pupil of Pavlov, finds that injury at the highest brain level interferes with the synthetic action of large areas of cortex, producing torpor and neurotic symptoms. Another pupil of Pavlov, Professor ROSENTHAL reported his studies on the elaboration of temporary conditioned reflexes in those with brain injuries; he assesses the initial degree of disturbance of cortical processes, and then tries to estimate—from the speed with which the patient acquires a conditioned reflex—what degree of recovery of function may be expected. Other members of Pavlov's laboratory have found that long periods of drug-induced sleep are particularly useful for cases of cerebral contusion.

NERVE REGENERATION

Regeneration of peripheral nerves has been studied by Professor LAVRENTJEV; he has used fixed pieces of nerve and spinal cord as transplants for bridging gaps in nerves, and finds he gets his best results with formalinised nerve because it acquires blood-vessels quickly and also delays the proliferation of connective tissue and fibrous elements in the scar. Heat was the only thing which seemed to hasten nerve regeneration. He suggests ligating the vessels of a nerve as a method of preventing the outgrowth of nerve-fibres and the formation of neuromas. Professor MAGNITSKY presented a study of the chronaxie of peripheral nerve after full and partial disturbance of its functions. Professor OREKHOVICH has studied the metabolism of degenerating and regenerating nerves and finds special histolytic enzymes at work during regeneration.

TYPHUS

Work on the specific prevention and early diagnosis of typhus of the classical louse-borne type has been carried out at the laboratory of Professor SMORODINTSEV. Discussing this, Dr. LEVKOVICH said that for the first time it had been possible to carry out, in an epidemic area, a large scale investigation of a vaccine prepared at the All-Union Institute of Experimental Medicine according to a modification of the Weigl technique. The original Weigl vaccine, it will be recalled, was prepared from the intestines of infected lice. Cox vaccine was also tested under epidemic conditions; this has been supplied by the representatives of the American Red Cross and was prepared from growths of *Rickettsia prowazeki* in the yolk sacs of developing fowl embryos and treated with phenol and formalin. In animal experiments these vaccines were compared with the Durand-Sparrow vaccine made from the lungs of infected laboratory animals. The Cox vaccine was shown to be the most effective of the three and the simplest to prepare. In the same laboratory the early diagnosis of typhus was studied by means of a complement-fixation test carried out at low temperature. The reaction is said to be sensitive and strictly specific, giving positive results as early as the first or second day of illness—a highly important finding. It will be recalled that I. A. Bengtson [1] in America has obtained positive results in endemic flea-borne typhus with a complement-fixation test in which she used as an antigen a suspension of rickettsias; the reaction was positive six or seven days after the onset and followed a course similar to that of the Weil-Felix reaction. A somewhat similar result was obtained in Q fever [2] but these reactions were carried out at 37° C. The earlier positive results in the Russian work are presumably due to the low temperature. These findings recall the work of R. L. Kahn,[3] who has found that the reaction bearing his name is intensified if carried out at 1° C.; but he considers that such strong reactions at low temperatures are of "general biological" rather than syphilitic type. A fuller account of the Russian work should be keenly interesting.

INSECTICIDES

Professor PETRISHCHEVA has devised ways to make insecticides from waste and cheap half-processed chemical by-products and from wild plants. Nearly 150 types of plant with insecticidal powers have been found in one of the Siberian regions, and several of the substances isolated have been tested against lice; they have proved effective for the disinfestation of clothing and vehicles, including railway carriages. Rossisky [4] has published an account of the use of 'Nassecamoyad,' a 10% solution of kerosene-carbolic soap, and also of 'Solvent,' a product retaining the highest homologues of benzol and toluol prepared by fractional distillation. He finds that nassecamoyad kills lice quickly without irritating the skin, and its protective action lasts 2–4 days. The fumes of solvent destroy lice in 9–12 minutes; this substance too is harmless to human skin. Heat treatment of clothing, though doubtless used, has not been mentioned lately by Russian workers, their attention having been directed towards the preparation of efficient insecticides. Chasovnikov [5] has written of the use of solvent in the field.

BACTERICIDAL STUDIES

Professor YERMOLEVA discussed the use of lytic agents in intestinal disease. Good results are reported from

1. *Publ. Hlth Rep. Wash.* 1941, **56**, 649. 2. *Ibid*, p. 327.
3. *Arch. Derm. Syph. N.Y.* 1940, **41**, 817.
4. *Soviet Med.* 1940, No. 3. 5. *Ibid*, 1940, No. 9.

the use of small amounts of 'Sulphadine' during phage treatment. Bacteriophage has, of course, been used in bacillary dysentery for many years, notably by A. Compton [6] in Alexandria. Sulphadine treatment has been described by Bobrovolskaia,[7] who gave it first to children suffering from dysentery complicated by pneumonia. It benefited both conditions and this led him to use it in uncomplicated cases of dysentery with excellent results. The dosage used was small, not more than 0·7 g. a day, with an average total dose of 1·1 g. In other countries sulphapyridine, sulphathiazole and especially sulphaguanidine have been used with success in bacillary dysentery but in larger doses than those quoted for sulphadine. Professor TOKIN as a result of ten years research has been able to establish that many plants have bactericidal properties, especially ordinary onion, garlic, radish and probably citrus plants. Exposure for 5, and in some cases 3, minutes to the vapour of these plants is said to inhibit and sometimes kill such organisms as streptococci, staphylococci and intestinal bacteria.

In England Now

A Running Commentary by Peripatetic Correspondents

ON April 4 I set out westwards from Kweiyang in West China with seven companions, one a doctor, and one our unqualified anæsthetist. We had a supply lorry and our two special vehicles—the mobile operating-theatre and the mobile X-ray department. On our journey over the Burma Road we visited several hospitals, and were able to do some X-ray examinations for which missionaries had long been waiting. At Hsiakwan we were held up by trouble with our supply lorry, and I had several glorious days on Hsiakwan mountain, where I made one ascent almost to the snow, reaching 11,000 ft. The many kinds of rhododendron were wonderful.

When we came to the Yunnan-Burma frontier at Wanting on April 22, there was an air-raid alarm in progress, and we crossed into Burma without having to stop or show papers to anyone. The frontier was not well marked, and even though in Burma, we seemed for practical purposes to be still in China. In Lashio we heard that a Japanese drive northwards from the South Shan states was seriously threatening the town and the road from Lashio to Mandalay. We still had time to get through, but we realised that the road would almost certainly be cut behind us. This would probably mean that our expensive vehicles would have to be abandoned, even though we might be able to get away on foot. We were at this time taking our instructions from American Army HQ. We asked the senior American Army officers in Lashio whether we should go on or not. They said we had a chance of doing a good job of work if we did. So being keener ourselves on going forward rather than back, we decided to take only one supply lorry and to send our valuable equipment back towards China. We set out in the early hours of Sunday morning and drove down to Maymyo. Shortly after this the Japanese reached the road and spread along it, taking Lashio and then spreading rapidly northwards so that they reached Myitkyina, in the north of Burma, in an incredibly short time.

Maymyo, normally a fashionable hill resort much frequented by society, we found deserted. We were given tea at a house, and were invited to take away anything we liked. If we had had the means to carry them we could have brought away a marvellous collection of strange things. The civil hospital was in the process of packing up, and here again we could help ourselves to anything we liked if we felt so disposed. From Maymyo we went on the same day through the ruins of Mandalay without stopping, and then across the great Ava bridge, blown up a few days later, which took us to Sagaing, on the west side of the Irrawaddy. Here we found accommodation for ourselves in the hospital. The town was pretty well deserted, and there was no buying or selling. Soon after we left Sagaing next morning we saw it being bombed and partly set on fire.

We moved that day to near Shwebo, and so fell in with Major Seagrave and his surgical unit. He is an American missionary doctor, now acting as a surgeon in the U.S. army. We stayed in the same Burmese house with his unit. After about three days there we were told to add ourselves to what was called a staging section in the British Army. This is a medical unit which gives minor treatment to wounded and sick soldiers in transit. We reported to No. 2 staging section, which was a small unit sitting about in a field where shade was hard to find. Shortly after arrival we heard a formation of Japanese bombers coming over, and then began the unpleasant noise of bombs falling rapidly. We mostly lay on the ground under the lorry, and soon it was over and we realised that we were all there and unharmed. But some men about 150 yards away had not been so lucky, and about 25 casualties were brought to us. Then followed a period of intense "blood, tears, toil and sweat," and that night ambulances took our patients away. I am afraid some of them had a bad time in transit, and some died who should have lived. That evening, having had news of enemy movements, we went on late into the night following a narrow road through dense jungle.

Sometimes the road surface was very bad and there were hair-pin bends so acute that the lorry had to go alternately backwards and forwards in the descent. The jungle looked glorious to wander in, but we had to keep moving, and there was no opportunity for catching butterflies or picking flowers. Next day the road conditions became almost impossible. We had to cross dozens of wide, dry waterways—or rather there were waterways which were so serpentine in their course that our route crossed the same one repeatedly. These were dry and sandy, and over and over again the lorry sank. Sometimes we had to cut down branches from trees and stack them in front of the wheels to let them get a grip on the loose sand. Vehicles were abandoned at these crossings, and several times we thought our motoring must end. Twice we gave our lorry up as lost and began to unpack the more valuable part of our equipment, but thanks to the Army we got through at last, and after doing a lot of hard work on the way our old lorry has now safely reached Calcutta, where it is undergoing a well-earned rest and overhaul. This lorry incidentally had an interesting history. Originally it was "rescued" by the Friends Ambulance Unit in Rangoon dockyard just before the Japanese arrived. Its bodywork was never completed, but in spite of this it was used on battlefields south of Mandalay, later going up to the Chinese frontier, and after this making the long and difficult journey across Burma, Manipur, Assam and Bengal to Calcutta.

Next day we reached Shwegu, on the east side of the Chindwin river. Here I had the good fortune to see a pair of "paradise flycatchers," really lovely little birds, black and white, with an enormously long tail several times the length of the body. The Chindwin was lovely as we travelled up-stream on its broad waters, between hilly, jungle-covered banks, and it was easy to ignore the countless rumours, which mostly turned out to be fallacious anyway.

At Kalewa, the civil hospital and all its equipment was handed over to me. Here we had a lot of casualties to deal with. We soon moved out from the hospital, which was too near the town to be safe, and opened up the local monastery as a hospital. Here we did some operating. Later the RAMC took this place over and we moved on.

We borrowed an old Ford lorry, and kept this and our Chevrolet working hard carrying wounded and civilian evacuees towards India and peace. All this time everything was tense and unnatural. There were no shops, no normal living conditions. The only people we saw were army units and the tragic hordes of Indian evacuees. The Indians were imported into Burma by the British because the Burmans could not be made to work. With the exit of the British the Indians came too, because apart from British control they could not live in harmony with the Burmese. They were a pathetic sight, and when the lorry was so packed that it was impossible to wedge in anyone else it was difficult to deal with the old men and women and mothers with babies who knelt on the ground to implore for help on their long and weary march. In one camp where we spent a few days a baby was born; its mother went on next morning. Here, also, we received a two-day-old baby which had been found lying by its mother's corpse at the deserted civilian hospital. We gave it to a native VAD who was doing

6. *Brit. med. J.* 1942, i, 719.
7. *Soviet Vrachebnii J.* April, 1941, p. 277.

splendid work looking after British and Indian wounded. Here at Tannu I met three men I had known at Thomas's, and one who had been at St. Paul's School, and just missed D. A. Patterson, an old schoolfellow. He is a padre, and was at Shwebo just before we went there.

After Tannu we followed a mountainous road over the Chin hills, and so came to Imphal, the capital of Manipur state. Here there had been one air-raid, and the civil population had left the town and not returned. There was not even anyone to remove the corpses decomposing in the streets—incidentally we did a fair amount of undertaker's work in Burma. At Dimapur we were entertained and well fed at the rest camp. The Army then gave us, including the lorry, free passes, so a few days later all our equipment, not to mention our personnel, completed the trip and landed in Calcutta. H. T. L.

* * *

It cannot often fall to the lot of a reviewer to discuss the first edition of a book and then, after an interval of a quarter of a century, to be asked to review the second edition. And when the work happens to be D'Arcy Thompson's *On Growth and Form*[1]—as I sincerely believe, the greatest contribution to biological science made in our generation—the privilege is of an altogether unusual kind. The first edition wandered with me everywhere; the binding was nibbled by silver fish in Australia and by cockroaches in Hawaii. The passage of twenty-five years has in no whit diminished the pure intellectual joy imparted by its reading. No brief account of the work can make real the beauty of the language, the profundity of the scholarship, or the perfectly rounded and patinated maturity of the whole thing. His father's *Daydreams of a Schoolmaster*, a real classical scholarship, a lifelong study of biology and an aptitude for mathematics are some of the factors that go to its making, but to all this there must be added that serenity of judicial outlook that refuses to be attracted by the new merely by reason of its novelty. As I re-read the old matter in the book and delighted in the new, I felt that its reading should be made compulsory for every one of the younger men who are today suffering, as perhaps never before, from a lack of historical background in the biological sciences. By them it should be read as a monumental example of the fact that the best scientific work can still be best presented without any distortion of the beauties of the English language. It should be read as an outstanding lesson in the exercise of mature and intellectual honesty of judgment and of restraint in dealing with certain fashionable doctrines. Indeed, there are occasions in which restraint has gone almost too far. There is much that is tantalising in the statement: "and I leave this great subject on one side not because I doubt for a moment the facts nor dispute the hypotheses nor decry the importance of one or the other but because we are so much in the dark. ..." One is left with the feeling that if that darkness is to be illuminated the author is likely to have a suggestion as to whence the light will come. Again, with shrinkage forms, enough has been told to make us realise the vast importance of the subject. The author says: "The subject is new and hardly ripe for full discussion: but it holds our promise." That is easy to realise. Will the promise be fulfilled? Shall we ever have the full discussion? The two editions of this book have been written during two wars. The scholarship that has gone to its making transcends all war and the reading of the whole thing makes war more remote—yet far more beastly in contemplation. We cannot await another war to usher in the dawn of a third edition in which some of our curiosity on shrinkage and many other things may be satisfied. Meanwhile we can only rejoice that there is still among us the master who can lead us through that strange world in which physical forces and chemical reactions play their parts as determinants of living form, and, by reason of the beauty of his diction, do it so that no part of the journey is dull or difficult to follow.

* * *

In 1928 a lady had a gastric ulcer. While she was in hospital, her physician looked at a laboratory report and said to the nurse, "There's occult blood too." The lady decided that they both looked very grave, and when she asked the nurse what it was all about the nurse refused to tell her. A year later she pursued her investigations further, when again under treatment. This time someone told her that occult blood meant that there was a minute amount of bleeding from somewhere in her inside; she repeated this explanation to two nurses, who dissolved, for some reason best known to themselves, into fits of laughter. Her ulcer was healed, but the worry remained. The other day, reading one of the *Daily Mirror* articles about venereal disease, the explanation flashed into her worried mind. She had VD. There is a moral here somewhere and it is obscurely connected with the moral of your story in "Three-in-One Doctor" (Oct. 3, p. 402), but both take a bit of drawing.

1. Cambridge University Press. Pp. 116. 50*s*.

Letters to the Editor

THE CHRISTMAS GIFT

SIR,—It is always with a feeling of hesitation, perhaps of fear, that I address this letter to you at this time of the year; hesitation and fear lest I should fail to state the cause effectively to your readers. But in my 25th year of office as president of the Royal Medical Benevolent Fund and as an old man myself, may I once more appeal on behalf of old doctors and their loved ones that the Christmas Gifts fund be continued in 1942. A gift of £2 to each of our beneficiaries on Christmas Day to bring some comfort, perhaps warmth or an unaccustomed enjoyment to homes where every penny has to be considered, is my desire. Will all friends who have helped me in the past do what they can again this year, and will others come forward as contributors to take the place of those who have had to drop out.

All contributions should be addressed to the hon. treasurer, Royal Medical Benevolent Fund, 1, Balliol House, Manor Fields, London, S.W.15, and cheques should be made payable to the "Christmas Gifts Fund."

THOS. BARLOW,
President, RMBF.

CERTIFICATION OF DEATH IN INFANCY

SIR,—Dr. Miller's article is of great interest to those who are not satisfied with our infant mortality rates. It was shown by the Registrar-General in his 1934 and 1937 reviews that the rates of England and Wales compared unfavourably with the national rates in Norway, Sweden or Holland. It has long been realised that certification of the causes of death of young infants leaves much to be desired, and the Newcastle Health Department is rendering useful service in persistently calling attention to it. Much light has been thrown, however, both upon the causes of neo-natal deaths and upon the possibilities of reducing them by the Chicago work, and conditions in that city are not very different from those in our own towns. In view of this work and the Ministry of Health's investigation in Holland before the war, we are not entirely ignorant about the reasons for the retarded improvement in our own country. But it is useless to press for reforms unless we are sure that they are likely to help towards the desired result, and some of Dr. Miller's suggestions seem to require examination on that and other grounds. He recommends that a mechanism might be provided which would enable a doctor, in cases which do not require notification to the coroner, to indicate that he does not know the cause of death, so that he can obtain an autopsy before giving a final certificate. There is some confusion here, for, if the doctor does not know the cause, the death is one which *should* be notified to the coroner, the registrar being instructed to notify any death "the cause of which appears to be unknown." A mechanism to enable the doctor to obtain an autopsy in such cases is already in existence. If the doctor informs the registrar that he is uncertain about the morbid condition which caused death, the coroner will be notified and can order an autopsy without inquest if he is satisfied that death was from natural causes. There is no other means of enforcing an autopsy, and Dr. Miller has made out no case for alteration of the law in this respect. In 15% of the infant deaths studied the investigators at Newcastle could not discover a cause, but we are left to surmise that, instead of using the mechanism outlined above, the certifiers had preferred in most instances to write down on the certificate what they considered to be the most likely cause. In another fraction of about the same size the investigators differed from the certifier as to the cause, and considered that injury at birth was often

certified otherwise. They also concluded that prematurity and gastro-enteritis were over-certified. There seems to be a common idea that to write injury at birth on a death certificate will mean an inquest, but 1933 statistics showed that inquests had been held on only 6·3% of deaths classed to that cause, whilst in 3% the coroner had ordered an autopsy without inquest, in 1·4% no certificate had been given and in the remaining 89% the coroner had accepted the certificate. The chance that such an entry will lead to an inquest is, therefore, a small one.

The way to ensure reliable national statistics of infant deaths is to use the machinery in existence in order to obtain an autopsy in every case of serious doubt. This is a difficult path to follow, but certifiers must decide whether the other considerations which press upon them in such cases are to be allowed to retard progress towards knowledge and towards the discovery of means of preventing such deaths in the future. The most recent figures available (Registrar-General's Review for 1933, pp. 145–157) show that in London the percentages of infant deaths certified after autopsy without inquest were much greater than in the rest of the country. Dr. Miller also recommends revision of the International List of causes of infant deaths by a committee of clinical pædiatricians. The list was carefully revised in 1938 by committees including such specialists both in this country and in America, and it will normally be revised again in 1948. Although your editorial states that "Miller shows good cause indeed for a revision of classification," I do not think that he himself will claim that he has advanced cogent arguments for an immediate revision. The main fault found is that inquiries are not sent by the Registrar-General asking for more information when certain causes, notably prematurity, are certified. But if an infant aged 1 or 2 months is stated to have died of prematurity alone, the inquiry would have to be whether there was any other cause not mentioned on the certificate which the certifier considered to be *more important* in causing death than prematurity. If an associated morbid condition was not considered more important, the classification of the death would not be affected by mentioning it; consequently the certifier would in fact be asked whether he had omitted what he considered to be the most important cause and entered only a subsidiary one. Apart from the natural annoyance engendered by such a question, would accuracy be appreciably advanced thereby? To inquire more often of the certifier about infant deaths where there was no autopsy would be unlikely, in my opinion, to add much to our knowledge at present.

Dr. Miller's first two recommendations deal with methods of informing the medical profession more fully on the importance of accurate death certification, and on this general question I would point out that the book of medical certificates does contain notes and suggestions which supply a good deal of the desired information. He recommends that a special form of death certificate for infants, including information about birth-weight, feeding and position of child in family should be introduced. Birth-weight and feeding cannot be usefully studied apart from many other factors, such as heredity, social position, mother's health and occupation and so forth, and the registrar would not be in a position to ask the questions necessary. These matters would surely be much better investigated *ad hoc* in a few areas than by attempting to amass national statistics, even if the administrative difficulties could be overcome.

Southport. PERCY STOCKS.

ANÆMIA IN PREGNANCY

SIR,—Your leader of Sept. 19 seems to take at their face value the figures given by Hamilton and Wright in their paper on the value of the administration of iron to pregnant women. Their two groups treated with iron and untreated each numbered 196 and had initial hæmoglobin levels of 75% and 79% respectively. If these two groups of pregnant women were samples of the same population, this difference in the average hæmoglobin level of the two groups must mean that the standard deviation of the population is at least 18. Such a standard deviation means that the final hæmoglobin levels of the two groups, 77% for the treated and 70% for the untreated, is likely to occur by chance, so that it is improper to conclude that iron had any effect on the hæmoglobin level at all. It is, of course, improbable that the standard deviation of the initial hæmoglobin of 400 pregnant women is as much as 18. The difference between the average initial hæmoglobin of the two groups may very well be due to the unfortunate planning of the investigation. The untreated group was seen on one day of the week, the treated on another, so that whoever estimated the hæmoglobin was bound to be biased unconsciously by knowing to which group any individual estimation belonged. This regrettable fact and the statistical argument given above make Hamilton and Wright's figures an uncertain basis from which to draw any conclusions about the value of iron administration to pregnant women. This argument, of course, does not prove that iron administration is valueless, but it would be a pity to force every pregnant woman to take an indigestible and tooth-blackening medicine for several months all to no purpose, and to use these figures to recommend the fortification of bread with iron.

What is striking, however, is that iron treatment had such a *small* effect on women with such comparatively low hæmoglobin values. Fullerton found some years ago that iron treatment brought the hæmoglobin level of pregnant women at term to a figure about 13% above the untreated figure of 75% (estimated by the same method as Hamilton and Wright and with apparatus apparently calibrated to the same 100%) in spite of the poorer economic status of his patients. This suggests that it was not really a low iron intake which determined the low hæmoglobin of the war-time patients but a war-time deficiency of some factor concerned in iron utilisation. Evidence has recently been presented that vitamin C conditions the utilisation of liver in pernicious anæmia (*Lancet*, 1942, ii, 278), and it is well known that iron treatment is useless in the iron-deficiency anæmia of scurvy unless vitamin C is given as well. It is a general experience in this country that plasma vitamin C levels are now much less than they were in peace-time. Would Hamilton and Wright consider it worth while to continue their observations by estimating the value of supplementary vitamin C in raising the hæmoglobin of pregnant women?

Oxford. R. H. MOLE.

TUBERCLE FOR TUBERCULOSIS

SIR,—It is with considerable misgiving that I have been noting the use in your annotations and leading articles of the word tubercle when tuberculosis is meant. And I see that the *Times*, following in your footsteps, published a leader last week entitled Treatment of Tubercle. Tubercle in the place of tuberculosis has been used colloquially by some tuberculosis workers for a long time, but on the whole its use has been frowned upon, and one certainly seems to hear it less and less. Is there any justification for its use in print apart from this? The lay public, I feel sure, knows tuberculosis much better than tubercle, and probably also spells it more correctly in spite of its greater length. And in foreign languages we certainly find no corresponding use of another word in place of (Fr.) *tuberculose*, (Ger.) *Tuberkulose*, &c. THE LANCET has been looked up to for many years as a champion of jargon eliminators. Hence its failure—if such it is—in respect of "tubercle" is all the more noticeable.

Staines, Msx. G. GREGORY KAYNE.

*** My predecessor James Wakley, who was something of a purist, wrote on the announcement of Koch's discovery—"But the organism of tubercle has hitherto eluded research" (*Lancet*, 1882, i, 655). And later in that same year Prof. Wm. Pirrie of Aberdeen entitled an address "the Infectiveness of Tubercle" (*Ibid*, 1882, ii, 171).—ED. L.

HERNIOPLASTY

SIR,—Squadron-Leader Arthur, in his interesting article on the treatment of inguinal hernia in the RAF, does not discuss the recurrence rate following the modification of McArthur's hernioplasty he describes. My former chief, Prof. P. P. Debono, has been using an almost identical modification at the Central Civil Hospital, Malta, for over fourteen years and the number of cases he has done must amount to several hundred. As far as I am aware neither the technique nor the end-results have ever been published, and up to the beginning of the war the statistics had not been collected. How-

ever, I believe I am correct in saying that it is Professor Debono's impression that the recurrence rate is very low indeed. He does not use fascial grafts as a routine but only in selected cases and he has devised a useful fascia carrier faintly resembling a Reverdin suture carrier. For some time I have been using the same technique with the difference that I use silk or cotton instead of catgut. So far the results have been gratifying.

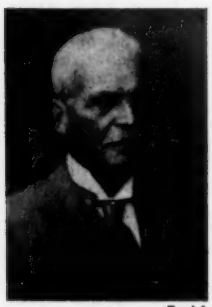
London, E.1. A. J. CRAIG.

Obituary

JOHN WALTER CARR

C B E, M D LOND, F R C P & S

Walter Carr, who died on Sept. 29, at the age of 80, belonged to a generation of physicians, now almost extinct, who took an interest in all departments of pure medicine. He was fellow of both the senior colleges and had gained experience of diseases of children at the Victoria Hospital, of diseases of the chest at the Brompton under Douglas Powell and of diseases of the nervous system at UCH under Charlton Bastian.



Vandyk

Only child of John Carr, JP, a chemist who had passed on his ambition to be a doctor to his son, John Walter was born in London and educated at University College School and Hospital where he qualified in 1884. He took his London degree in the following year with first-class honours in medicine, surgery and midwifery. His first honorary appointment was as assistant physician to the Victoria Hospital in 1889 and he remained on the staff till he became consulting physician in 1920. Outside medicine one of his chief interests was education, and when he was appointed assistant physician to the Royal Free in 1893, and a few years later lecturer in medicine at the women's school, he worked wholeheartedly for students. His teaching was largely modelled on that of his old chief, Christopher Heath, a former PRCS. He was also on the council of Epsom College and was associated with the examinations for the state registration of nurses. He was a freeman of the City of London and from 1914 a member of the court of the Haberdashers Company which he also served for a term as master. In such duties, especially those connected with the Drapers and Haberdashers schools, he found solace as professional claims diminished. He was a great traveller, but in recent years a severe multiple arthritis deprived him of the long walks which he had enjoyed both at home and in Switzerland.

About 40 years ago Carr was smitten with writer's cramp, and though he learned to write with his left hand this disability and his heavy hospital and teaching duties prevented him from contributing as much to medical literature as he might have done. Perhaps his most important paper was on non-tuberculous posterior basic meningitis in infants, the first complete account of the disease published in this country, in which he pointed out its probable relationship—later to be confirmed by Still—to cerebrospinal fever. His official addresses to the Medical Society of London were common sense, expressed with dry humour spiced with cynicism. Their matter after twenty years is still the controversy of the hour. In "Medical Ambitions and Ideals" he sets out the dangers he saw inherent in a state medical service in which the ministry of health took the place of the medieval church with its chief medical officer as an uncrowned pope. In "A Medical Utopia" he pictures the tonsil-less, appendix-less, vaccine-filled being which this benevolent autocracy might be expected to produce. For himself he would rather see England free than healthy, and he urged his colleagues not to lose sight of primary causes when seeking to ameliorate secondary consequences.

His CBE was in recognition of his work at the hospital for officers, carried on in a part of the Royal Free during the last war. His knowledge of affairs made him a valuable member of committees, and his straightforward, fearless but tempered judgment carried great weight both in the councils of his hospital and of the RCP where he served as censor 1926–28. He married in 1895, Jessie, daughter of Walter Griffith, of Streatham Hill. She died in 1937 and they leave a son and three daughters, two of whom married medical men.

GEORGE ARTHUR EWART

B A CAMB, F R C S

Mr. G. A. Ewart, surgeon to St. George's Hospital, died on Oct. 2, at the age of 56, after one day's illness. He was the son of Cossar Ewart, FRS, professor of zoology in the University of Edinburgh, and was educated at Clifton College, Edinburgh University and Christ College, Cambridge. At both universities he gained scholarships, and at Cambridge he took a first-class in the natural sciences tripos, besides representing the university at cross-country running. Qualifying at St. George's in 1912, he took the FRCS two years later, and was shortly afterwards appointed to the assistant staff, which he was to serve for fifteen years before proceeding to the senior staff. During last war as a temporary major RAMC he worked in France, and in the 4th London General Hospital at home. His other peace-time appointment was to the Hospital of SS. John and Elizabeth to which he was consulting surgeon at the time of his death.

As Ewart grew older his surgical interests became more and more concentrated on the surgery of the abdomen, and, in particular, on acute abdominal diseases. He had a flair for this work, and combined sureness of diagnosis with a technique which was equally sure, but which he loved to make dramatic. His long service as assistant surgeon had given him an exceptional experience in abdominal emergencies, and even when on the senior staff he was always keen to do this kind of work himself. As a teacher Ewart was effective—one of those men who belittle their own knowledge to give their students the feeling that the gulf between themselves and their teacher is not unbridgeable, and that their difficulties are really understood.

Many generations of George's students will remember with gratitude the friendly hospitality which they received from Ewart and his family, and many others who were of his profession or who shared his abounding interest in country things—shooting, natural history and photography. He married in 1914 Dorothy, daughter of Sir George Turner, surgeon, rear-admiral and writer, and they had one son and two daughters.

EDWARD FAWCETT

M D EDIN, F R S

ON Sept. 21 Professor Fawcett, who for forty-one years held the chair of anatomy in the University College and University of Bristol, died suddenly while walking in the street. He had occupied a pre-eminent place in the work of the university and in the affections of many generations of medical students.

Elliott & Fry

He came to Bristol as a young man in 1893, four years after he had qualified at Edinburgh University, to be the first full-time professor of anatomy in University College, and he captured the attention of a none too orderly crowd of medical students immediately by his capacity to lecture, to demonstrate, to illustrate by drawings and by his power of keeping order. Perhaps he had other gifts besides his grasp of anatomy that gave him authority in his class-room. He was an all-round athlete, and as a cricketer might have found a place in almost any county team. Edward Fawcett was born in 1867, the son of Thomas Fawcett, BA, at Blencow, near Penrith, and was educated at the grammar school there and at Edinburgh University. By 1887 he had become a demonstrator of anatomy in the Edinburgh School of Medicine and after he graduated in 1889 he was demonstrator of anatomy

at Yorkshire College, Leeds, till he was called to Bristol. In 1906 he became dean of the faculty of medicine and he played an important part in organising the faculty when the university was given its charter three years later. Successive vice-chancellors relied implicitly upon his judgment and experience in all that related to medical study, and their confidence was justified. For he was able and diligent in his attention to affairs. Academic honours naturally came to him, and in 1906 he won the gold medal for his MD thesis at Edinburgh. In 1909 he was made president of the anatomical section of the International Congress of Medicine at Budapest, and from 1927 to 1929 he also held that office in the Anatomical Society.

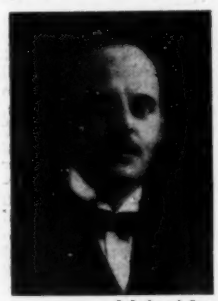
Fawcett's researches into the development of the human skeleton and of the mammalian chondrocranium won for him the FRS in 1923, but the beautiful wax models which illustrated his work have been lost by enemy action. Apart from his prowess at cricket Fawcett had many hobbies. He was an indefatigable cyclist and used his bicycle on many expeditions to study church architecture. He was a first-rate photographer, and some of his best work illustrated his presidential address to the Bristol and Gloucestershire Archæological Society in 1936 when he spoke on anthropophagous sculpture and royal arms in churches. For many years he represented Bristol on the Central Council for the Preservation of Churches, and for the past months he had been rephotographing local churches for the national collection. Prehistory was another of his recreations, and he was energetic in his support of the University Spelæological Society, of which he was for many years president, and he was the enthusiastic comrade of the youngest undergraduates on expeditions to explore the caves of the Mendips.

Professor Fawcett married in 1895 Edith Dora Wordsworth, and he leaves her with a daughter and a son, A. W. Fawcett, surgeon to the Sheffield Royal Infirmary.

FRANK HOLT DIGGLE

OBE, MB MANC, FRCS

Holt Diggle died at his home in Dunham Massey, Cheshire, on Sept. 30. He was dressing when a heart attack took him away with tragic but merciful suddenness. Only back a few days from a short holiday in the English Lakes, he was at work as usual on the day before his death. Born in the Lancashire town of Heywood fifty-seven years ago, he took his medical course at the Manchester University, graduating MB with second-class honours in 1909. Although his contemporaries in the medical school were a galaxy the like of which the school may never know again, Diggle's star was not dimmed by comparison. In face of keen competition, he took medals in anatomy, gynæcology and medicine; these, in addition to the Bradley surgical scholarship and the Agnew scholarship for diseases of children. In 1910 he obtained the English conjoint qualification, and three years later the fellowships of the English and Edinburgh colleges of surgeons. Before joining the Army in 1915 his experience included appointments in Manchester and London and a spell of general practice in Bradford. Till 1919 he served as a surgical specialist in the RAMC, and for his services in the Near East he was awarded the OBE and mentioned in dispatches.



J. Ingham & Sons

The war over, Diggle held resident and honorary appointments in hospitals in Birmingham, but in 1920 on his appointment as oto-laryngologist to the Ancoats Hospital, Manchester, he came home again, and although later he joined the Manchester Ear Hospital, the Christie Hospital and Holt Radium Institute and was consultant to many other hospitals outside the city, it is for his work at Ancoats that he will be remembered. He was its first aural surgeon, and starting from nothing he built up a big, well-equipped and well-organised clinic. Despite heavy calls on his time and energies he made opportunities to write on many problems in his specialty, following closely in the steps of his teacher—the late Sir William Milligan—and the scope of his writings shows the breadth of his interests: the rôle of nasal disease in asthma; the influence of disease of the thyroid gland on disorders of the nose, ear and throat; foreign bodies in the air and food passages; the surgical treatment of lacrymal obstruction; cancer of the larynx. He attended regularly the meetings of the Royal Society of Medicine and the Manchester Medical and other societies. He knew all the important British clinics and had visited many of the foreign ones as well.

Diggle's best card in his strong hand was his laryngeal surgery. His long training in general surgical technique stood him in good stead, and in the conflict between surgery and ray-therapy in the treatment of laryngeal malignancy, he preserved a nice balance and a fine judgment. There was a good deal of the artist in his make-up, sensitive, self-critical, imaginative and creative. His sensitiveness led him sometimes to misunderstand his fellows and sometimes to be misunderstood. His self-criticism drove him to give of his best to all at all times, and to demand an exactingly high standard of those who worked with him, though he never stinted praise or thanks as a just reward for good service. His self-criticism, too, made him face surgical failure in the Mackenzie tradition, asking why and seeking the answer; in success, he had something of Ambroise Paré's humility. From the imaginative side of his nature sprang the restless desire to try new ideas and hazard new methods; in his private life it showed itself in an appreciation of the arts and a love of music.

Frank Diggle had no absorbing hobby but many interests. He played a round of golf with enthusiasm, though it must be admitted that his back-chat was better than his back-swing. Essentially a family man, he was at his most likeable best in his home, where his generous heart and happy Lancashire wit shone in their true setting. With his widow and daughter we share his memory and mourn his loss.

V. L.

Dr. A. T. NANKIVELL, who died at Abingdon, Berks, on Oct. 3, had been MOH successively for Hornsey, Poole and Plymouth. He collaborated with R. T. Hewlett in *The Principles of Preventive Medicine*, and wrote a popular primer on *The Science of Hygiene*. For many years he was lecturer in epidemiology at King's College, London.

Infectious Disease in England and Wales

WEEK ENDED OCT. 3

Notifications.—The following cases of infectious disease were notified during the week: smallpox, 0; scarlet fever, 2423; whooping-cough, 845; diphtheria, 860; paratyphoid, 5; typhoid, 6; measles (excluding rubella), 3801; pneumonia (primary or influenzal), 508; puerperal pyrexia, 172; cerebrospinal fever, 61; poliomyelitis, 33; polio-encephalitis, 6; encephalitis lethargica, 3; dysentery, 232; ophthalmia neonatorum, 95. No case of cholera, plague or typhus fever was notified during the week.

The number of civilian and service sick in the Infectious Hospitals of the London County Council on Sept. 30 was 1566, including scarlet fever, 455; diphtheria, 193; measles, 172; whooping-cough, 217; enteritis, 64; chicken-pox, 56; erysipelas, 44; mumps, 48; poliomyelitis, 11; dysentery, 52; cerebrospinal fever, 8; puerperal sepsis, 23; enteric fevers, 10; german measles, 2; glandular fever, 1; other diseases (non-infectious), 124; not yet diagnosed, 86.

Deaths.—In 126 great towns there were no deaths from the enteric fevers, 6 (0) from measles, 3 (0) from scarlet fever, 13 (3) from whooping-cough, 20 (0) from diphtheria, 72 (6) from diarrhœa and enteritis under two years, and 12 (1) from influenza. The figures in parentheses are those for London itself.

Liverpool reported 3 fatal cases of diphtheria. There were 8 deaths from diarrhœa at Liverpool, 7 at Birmingham and 6 at Manchester.

The number of stillbirths notified during the week was 201 (corresponding to a rate of 31 per thousand total births), including 32 in London.

MEDICO-LEGAL SOCIETY.—A meeting of this society will be held at 26, Portland Place, London, W.1, on Thursday, Oct. 22, at 4.30 PM, when Lieut.-Colonel W. W. Mansfield, MIMechE, will read a paper on disguise in handwriting.

Parliament

ON THE FLOOR OF THE HOUSE

MEDICUS M.P.

THE House is getting more health-conscious. A question by Sir Smedley Crooke asking for a mobile immunisation service van for diphtheria to be sent to other cities in view of its success at Portsmouth led to a round of supplementaries like a first-rate political issue. Health indeed has become a first-rate political issue.

When he announced the completion of the MRC report on tuberculosis the Minister of Health said he had already taken action on a number of points. The question, the answer, and the supplementaries occupy more than four columns of Hansard—more than sometimes is given to questions on an important war issue. And they were very lively questions. Indeed more members rose than could get their questions in. The adoption of mass radiography and the acquiring of 30 sets of apparatus plus arrangements for the training of the necessary expert staff is quick action. It is to be hoped that the provision of the extra accommodation for treatment envisaged by the Minister will not be held up for lack of nurses. Perhaps the most important provision announced by the Minister is the authorisation given to local authorities to grant financial assistance for the maintenance of the dependants of those undergoing treatment. These grants are to be made as part of the public-health service and it will not involve a means test.

As to whether these facilities apply to ex-Service men the Minister was not so explicit as on other points, but it is clear that an ex-Service man (or woman) is in the same position as any other member of the public. The Army do not accept liability for the tuberculosis of men discharged from the Service, unless it is accepted as attributable, which is rare. There seems every reason to hope, therefore, that adequate treatment may now become available. The Secretary for Scotland, Dr. Tom Johnston, was pressed to make a full statement from the Scottish angle but preferred to wait until he had consulted with local authorities.

Good as the facilities for diagnosis are, everything turns on the facilities for treatment of early cases and—a matter on which Mr. Brown did not touch—on treatment and isolation of advanced cases to prevent the spread of infection. A rise in the incidence of tuberculosis occurred in the last war and it occurred in Germany and in Russia as elsewhere. The need for tackling the problem today is now so clearly recognised that nothing should be allowed to stand in the way. It is hoped that special attention will be given to the ex-Service cases and that the differences in methods of dealing with cases, and of accepting financial responsibility for cases, will not be allowed to stand in the way of a nationally efficient system.

MINISTER'S STATEMENT ON TUBERCULOSIS

"We are about to begin a new drive against consumption—a drive of a kind never attempted before in this country."

Mr. JAMES GRIFFITHS asked the Minister of Health whether he was in a position to make any further statement on tuberculosis.—Mr. E. BROWN replied: I am grateful that the committee which was appointed by the Medical Research Council at my request has completed its report which was published on Oct. 8. I have kept in touch with the committee and have already taken action on a number of points which are included in their recommendations. To facilitate early diagnosis we obtained priority for the supply of some 30 sets of equipment for mass radiography. We are allocating them to large centres of population where they can be used to the best advantage. In consultation with local authorities and with the assistance of an expert committee we have arranged for the training of the necessary expert staff the operation of this equipment. Deliveries will be gradual and arrangements for operation in the individual districts and for coöperation between authorities must be worked out in detail, but I expect that an effective start will be made in the New Year. The extended arrangements for diagnosis will mean some increase in the need for accommodation. Additional beds are being allocated to meet this need and action is being taken to meet the needs for nursing and domestic staff. Domestic and nursing work in hospitals, including sanatoria, is regarded as war service for which suitable women of any age-group may volunteer and to which they may be allocated by the Ministry of Labour and National Service, and I have been in consultation with my colleague with a view to special attention to districts where the working of sanatoria is being hampered by a lack of the necessary staff. Immediate needs in regard to trained nurses can only be met by a better distribution of the trained nurses available. Detailed plans to facilitate such a distribution and, in particular, to secure the most effective use of nurses who are completing their training, members of the Civil Nursing Reserve, and nurses who can be temporarily spared without prejudice to the current efficiency of the hospital to which they are attached, will be worked out by my regional officers in consultation with representatives of the hospitals and of the nurses.

Where facilities for diagnosis and treatment are available it is important that those who give up work temporarily for treatment, which is in the interest of the public health no less than their own, should be able to do so without financial anxiety as to the maintenance of their dependants. Local authorities are accordingly being authorised to grant financial assistance to provide for the maintenance of the dependants and to avoid the break-up of the home while the breadwinner is undergoing treatment. This assistance will be administered by the public-health authorities as a part of the approved treatment under the tuberculosis scheme, and the cost incurred by them in accordance with detailed arrangements which I am now working out with their representatives will be repaid from Exchequer funds. The Secretary of State for Scotland authorises me to say that he is making similar arrangements in Scotland.

DIFFICULTIES TO BE MET

Mr. J. GRIFFITHS: Is the Minister satisfied that he will be able to secure the necessary number of nurses to provide the service outlined, and in regard to the assistance to dependants, since the payments would come out of the Exchequer, will they be on a scale determined nationally?—Mr. BROWN: The flat scale will be so determined, but the plan is a flat rate for maintenance and extra grants for standing charges, such as educational costs and rents and things of that kind. I am now discussing the details with representatives of the Association of Municipal Corporations, the County Councils Association and the London County Council. We are drawing up in the light of the local knowledge of my regional staffs a priority list of the hospitals in which the need for nurses is urgent. It will include a large proportion of the sanatoria, and we shall then ask the various training schools to provide a quota of the nurses coming out of training for allocation to these hospitals. We shall also review the Civil Nursing Reserve and nursing staffs in hospitals for current needs with a view to allocating them and attaining the end we all want. Replying to further questions Mr. Brown made it clear that the maintenance payments were not to be on the basis of a means test but were to be part of the public-health service. The Ministry of Health were in touch with other ministries with a view to reducing the incidence of non-pulmonary tuberculosis which could be traced to infected milk. On the question of pasteurisation he referred the House to answers which he had given during the last year.

Captain G. S. ELLISTON asked whether the mass radiography sets would be available for selected counties and county boroughs where the medical officer of health had submitted an approved scheme?—Mr. BROWN: We shall work in coöperation with the authorities. The sets are transportable, but they are best kept at places where they can be used for a period.—Mr. F. J. BELLENGER: Will these facilities both for treatment and for maintenance of dependants apply to that large number of men who will be discharged from the Services as a result of this disease?—Mr. BROWN: They will apply to all who are concerned with common tuberculosis and the work done in connexion with the arrangements at local sanatoria. There are a number of discharged Service men in the sanatoria.—Sir FRANCIS FREMANTLE: Will the Minister be in touch with the ministries of the fighting Services so that they prevent tuberculous men from getting into the Services and having to be invalided out later on?—Mr. BROWN: The initiative in the use of mass radiology was taken by the Services.

Replying to further questions Mr. Brown said that the Ministry of Health had under consideration the question of help and encouragement for the after-care committees.

Mr. T. JOHNSTON, Secretary of State for Scotland, informed Mr. G. BUCHANAN that he would make a statement on the scheme as it affected Scotland after he had consulted with the local and health authorities on the subject. Mr. A. MACLAREN asked the Minister if he was not aware that all this expense might be more or less abortive owing to the present bad housing conditions and urged that something must be done immediately to deal with that problem. No further reply was given.

QUESTION TIME

Cod-liver Oil and Fruit Juices for Children

Mr. H. BROOKE asked the Parliamentary Secretary to the Ministry of Food whether he could give figures showing, on a comparable basis, the proportions of eligible children for whom parents or guardians were obtaining cod-liver oil and fruit juices in the period before April when these were made available to them by the Ministry free of charge, and the present proportions now that they were available for a small payment.—Mr. W. MABANE replied: I regret that it is not possible to supply comparable figures, as the ages of entitlement have varied during these periods. Also, the products are still distributed free of charge to children where the weekly income of the parent(s) or guardian(s) does not exceed certain limits. From the commencement of the scheme in December, 1941, and until Feb. 1, 1942, only children under two years of age were entitled to cod-liver oil. From Feb. 1 to March 31 all children holding R.B.2 ration books (i.e. children under six years) were entitled to supplies. During the period December to March 31 all children up to two years were allowed fruit juices free of charge. Payment for the products was introduced on April 1, 1942, and supplies of cod-liver oil were then restricted to children under five years of age. From April 1 to July 6 only children under two years were entitled to fruit juices, but as from the latter date the age of entitlement was raised to three years. The figures given below, although they cannot be used for purposes of comparison in view of the discrepancy in the ages of entitlement, give a picture of the take-up during the periods before and after payment was introduced.

Average weekly take-up of:		Per cent. of children eligible
Cod-liver oil during four weeks in	March, 1942	24·1
" " " "	June, 1942	12·8
Fruit juices " " "	March, 1942	38·8
" " " "	June, 1942	33·9

Diphtheria Immunisation

Sir SMEDLEY CROOKE asked the Minister of Health if, in view of the success attending the experiment of sending the mobile immunisation service for prevention against diphtheria to the children at Portsmouth, he would consider similar service being sent to children in other cities and large towns where the need for immunisation was equally urgent.—Mr. BROWN replied: I have already taken steps to ensure that this idea is brought to the notice of local authorities generally by my regional officers, and every opportunity is taken of recommending it in areas where it is likely to be practicable and useful.—Sir S. CROOKE: Is the Minister satisfied that there is sufficient vaccine?—Mr. BROWN: We can do the job for the moment.—Captain GODFREY NICHOLSON: Will the Minister consider the preparation of full-sized cinema films which can be used for propaganda? At present the available films are not suitable for exhibition in an ordinary cinema.—Mr. BROWN: I will look into that point.

Wing-Commander A. W. H. JAMES asked the Minister whether, since the immunisation of children against diphtheria was available without cost to all parents, he would make an order that the full cost of treatment of diphtheria cases should be recoverable from parents in cases where the patients had not been immunised.—Mr. BROWN replied: I do not feel that I should be justified in adopting this suggestion.

Shortage of Hospital Staffs

Sir R. GLYN asked the Minister of Labour what representations he had recently received from the governing bodies of the London voluntary teaching hospitals as regards the position of the hospitals under existing circumstances of increasing work with decreasing staff on account of the continued calling up by his department; whether he was aware that nurses were being overworked as well as the medical staff; that domestic help of the kind and quantity required was not obtainable; and whether he would arrange that the existing staff, both medical and lay, be directed to remain at their posts and that, as far as possible, other essential help would be supplied.—Mr. ERNEST BEVIN replied: I have received no representations from the governing bodies of these hospitals on this general subject, and would point out that nursing staff and women domestics in hospitals are regarded as reserved and are not called up by my department and men over military age would not be withdrawn. Applications for the deferment of calling up of men of military age are considered individually and no man would be called up until after consultation with the Ministry of Health. The selection of medical practitioners for H.M. Forces is carried out by the Central Medical War Committee subject to the approval of the Minister of Health. I am aware of a shortage of nurses and domestic staff in certain hospitals. As I have repeatedly stated, nursing and domestic work in hospitals is regarded as vital war work for women of all ages and in addition hospitals themselves can help to meet labour shortage by employing part-time domestic workers to the fullest possible extent. The whole question of making the best use of the services of hospital staff is under constant review.

Hospital Surveys

Mr. A. PEARSON asked the Minister of Health whether he was aware of the dislike of the contents of his letter dated July 9, 1942, to the chairman of the Nuffield trustees, indicating proposals to organise surveys of local authority hospitals and that a secret report was to be made to him by the voluntary organisation on coördination and development of the service in the area the local authority administers; and what indications he had had from Welsh local authorities of their unwillingness for such surveys and secret reports to be made by a voluntary body on their statutory responsibilities.—Miss F. HORSBRUGH replied: The Minister has received no such representations from Welsh local authorities, and the second paragraph of the letter referred to indicates that the Nuffield trustees will undertake surveys only after the representatives of the voluntary hospitals and of the local authorities in the areas concerned have signified their willingness for a survey to be organised.

Examination of Women Workers

Lieut.-Commander G. I. HUTCHISON asked the Minister of Labour whether, with a view to preventing women who were not in good health being directed to munition work away from home, he would consider the advisability of arranging that all mobile women should undergo a medical examination before being sent away from their own district.—Mr. BEVIN replied: It is always open to a woman to bring medical evidence to show that she is not fit to undertake employment which is proposed for her, and if necessary arrangements are made for a medical examination. As at present advised I do not consider that a routine or compulsory medical examination is desirable.

Medical Report on National Flour

Mr. ROBERT MORRISON asked the Parliamentary Secretary to the Ministry of Food if he was aware that doctors were prescribing 'Ryvita' for persons forbidden to eat bread and potatoes; and whether arrangements would be made in these cases to supply this food free of points, or whether the Ministry's medical advisers could recommend an alternative unrationed food.—Mr. MABANE replied: The question of the sensitivity of certain persons to national flour is at present under consideration by the Food Rationing (Special Diets) Advisory Committee of the Medical Research Council and my department is awaiting a report.

Saccharin

Mr. W. J. THORNE asked the Parliamentary Secretary to the Ministry of Food if he was aware of a shortage of saccharin tablets which were so valuable to thousands of householders; and if he intended taking any action in the matter.—Mr. MABANE replied: I am aware that there is an unsatisfied demand for saccharin tablets, but as the raw materials are required for more essential purposes I can see no prospect in existing circumstances of increasing the present production, which is about 25 times prewar output.

Quinine

General Sir GEORGE JEFFREYS asked the Minister of Supply whether our supplies of quinine were adequate; and, if not, what steps were being taken to replace them.—Mr. CHARLES PEAT replied: Supplies of quinine are adequate for a considerable period. Active steps have been taken to manufacture synthetic substitutes to replace quinine in the treatment of malaria.

Medical News

University of Cambridge

At recent examinations the following were successful:

DMRE

Part II.—R. A. D. J. Bernhardt, A. B. Donald, H. R. Holmes, Benzion Kounine, Arnost Preiss, R. A. Williams and Hugh Wormald.

Royal College of Surgeons of England

At a meeting of the council of the college, held on Oct. 8, with Sir Alfred Webb-Johnson, the president, in the chair, it was decided to increase the membership of the court of examiners from 17 to 20. Mr. A. J. Graham was nominated as the fiftieth Jenks scholar. A Leverhulme scholarship was awarded to F. K. Sanders, D Phil, who is investigating problems connected with the repair of peripheral nerve injuries. Dr. Douglas Lea was nominated for reappointment and Dr. Lilian Walter for appointment as Prophit students for cancer research. Mr. Geoffrey Bourne, D Sc, has been reappointed a Mackenzie Mackinnon research fellow.

Diplomas of membership were granted to T. D. Kellock, H. G. McQuade, J. R. K. Preedy, D. S. Short, Edith M. Waterhouse, and J. F. R. Withycombe. Diplomas in child health were granted jointly with the Royal College of Physicians to the following:

A. P. Bentall, Elliott Emanuel, E. G. Fox, J. F. Galpine, Aitolia Georgiadis, Margaret E. Harker, D. C. Jackson, Elizabeth B. S. Scobbie, and Vera Settle.

Society for Relief of Widows and Orphans of Medical Men

At a quarterly court on Oct. 7 Dr. R. A. Young, senior vice-president, being in the chair, respect was paid to the memory of Mr. V. Warren Low, president for thirteen years. The accounts for the half-year ended June 30 were approved; grants to widows during this period came to £1937 10*s.*, and £2090 had been invested. After being for some years in abeyance, it was decided to make a Christmas present this year of £7 10*s.* to each widow in receipt of a grant. Membership of the society is open to any registered medical man residing within a twenty-mile radius of Charing Cross. Particulars from the secretary, 11, Chandos Square, London, W.1.

Royal Medico-Psychological Association

A meeting of this society will be held at 10.30 AM, on Wednesday, Oct. 21, at 11, Chandos Street, London, W.1, when there will be a symposium on the incidence of tuberculosis and dysentery in mental hospitals.

Institute of Chemistry

The South Yorkshire section will hold a special meeting on the chemist and industrial health at Sheffield city hall on Thursday, Oct. 22, at 2.45 PM. Dr. F. S. Fowweather and Dr. M. W. Goldblatt are to be the opening speakers. Further information from the hon. secretary of the section, at 52, Whirlow Grove, Sheffield, 11.

Photography in Industry and Science

During November the Association of Scientific Workers is promoting an exhibition illustrating this title which will include work on mass radiography and nuclear physics. Sir Robert Watson Watt, FRS, will open the exhibition on Oct. 13, at 3 PM, in the rooms of the Royal Photographic Society at 16, Prince's Gate, London, SW7.

North Western Tuberculosis Society

A meeting of this society will be held at 3 PM on Thursday, Oct. 22, at the tuberculosis offices, 352, Oxford Road, Manchester, when Wing-Commander R. R. Trail will speak on mass miniature radiography.

Chadwick Lecture

On Tuesday, Oct. 27, at the Royal Sanitary Institute, 90, Buckingham Palace Road, London, SW1, Mr. W. T. Creswell, KC, will give a Chadwick lecture on the forensic aspects of war-time public-health legislation.

RAMC Casualties

WS/Captain R. J. F. Howe, MRCS, previously reported prisoner, is now posted as wounded and prisoner. Major M. E. M. Herford, MBE, MB Brist, has been wounded and the following officers have been taken prisoner: Captain William Falconer, MB Edin., Lieut.-Colonel J. T. Lewis, FRCP, and Major J. W. Redgate, MRCS.

Royal Society of Medicine

A meeting of the fellows of this society will be held on Tuesday, Oct. 20, at 5 PM. At 2.30 PM on the same day there will be a discussion at the section of orthopædics on painful feet. The openers are to be Mr. C. Lambrinudi, Dr. E. J. Crisp and Mr. H. L-C. Wood. At 2.30 PM, Oct. 21, at the section of comparative medicine, Prof. Alexander Fleming, Mr. A. T. Glenny and Mr. Percival Hartley, FRS, will open a discussion on active immunity. The urology section is holding a clinico-pathological meeting on Oct. 22, at 3.45 PM. Dr. Helen Mackay, Dr. Leonard Findlay and Dr. Hugh Sinclair are speaking at the section of disease in children on Oct. 23, at 2.30 PM, when there is to be a discussion on nutritional anæmia in children and women as a war-time problem.

Dietetic Course for Nurses

The Royal College of Nursing has organised a dietetic course for nurses which will include 240 hours of practical experience in the dietetic departments of the Hammersmith Hospital, the London Hospital and in the canteen of the Morgan Crucible Company. There will also be lectures on chemistry, physics, biochemistry and physiology. Food for the sick, the healthy and the infant will be discussed and there will be lectures on the new dehydrated foods and on war-time deficiencies to be guarded against in communal feeding.

Further particulars may be had from the director of the education department of the college, Henrietta Place, London, W.1.

The Index and title-page to THE LANCET, Vol. I, 1942, which was completed with the issue of June 27, is now ready. A copy will be sent gratis to subscribers on receipt of a post card addressed to the Manager, 7, Adam Street, Adelphi, W.C.2. Subscribers who have not already indicated their desire to receive indexes regularly as published should do so now.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in this paper should not be taken as an indication that they are necessarily available for export.

Births, Marriages and Deaths

BIRTHS

BANKOFF.—On Oct. 7, the wife of Mr. George Bankoff, FRCS, of Harley Street, W.1—a son.

BARCLAY.—On Oct. 3, at Devonport, the wife of Dr. Gordon Barclay—a daughter.

GORDON-GRAY.—On Oct. 1, in Aberdeen, the wife of Major Stuart Gordon-Gray, RAMC—a daughter.

GREENE.—On Oct. 6, at Sutton, Surrey, the wife of Lieutenant A. C. Greene, IMS—a daughter.

LEVICK.—On Oct. 5, at Windsor, the wife of Lieutenant R. K. Levick, RAMC—a daughter.

MANNING.—On Oct. 3, at Farnborough, the wife of Dr. F. R. C. Manning, RAFVR—a daughter.

NICHOLSON.—On Oct. 6, at Sutton Coldfield, the wife of Mr. J. C. Nicholson, FRCSE, RAMC—a daughter.

NORMAN.—On Oct. 6, at Poole, the wife of Surgeon-Lieutenant R. T. Norman, RNVR—a daughter.

ORAM.—On Oct. 5, the wife of Lieutenant Sam Oram, RAMC—a daughter.

ROBINSON.—On Oct. 2, in Glasgow, the wife of Captain Wilfred Robinson, RAMC—a daughter.

STOKES.—On Oct. 8, in London, the wife of Dr. J. F. Stokes—a daughter.

STRATON.—On Oct. 1, in Edinburgh, the wife of Surgeon-Lieutenant James Straton, RNVR—a son.

TOWNSEND.—On Oct. 6, the wife of Captain E. W. J. Townsend, RAMC, of Hampton-on-Thames—a daughter.

MARRIAGES

FIELDING—COOK.—On Oct. 3, in Leeds, John Fielding, MD, to Elizabeth Muriel Cook.

DEATHS

CHANDLER.—On Oct. 8, Frederick George Chandler, MD CAMB, FRCP, of Park Square West, N.W.1, and Newdigate, aged 57.

COLEMAN.—On Oct. 2, at Grenoble, Albert Coleman, MB EDIN, Lieut.-Colonel IMS (retd.), aged 79.

HARRIS.—On Oct. 3, at Ashurst, Herbert George Harris, MD DURH, of Southampton.

ROBERTS.—On Oct. 6, at Twyford, Hants, George Augustus Edward Roberts, MRCS, DPH, aged 80.

ROBINSON.—On Oct. 5, Frank Robinson, MD MANC, DPH, of St. Paul's Road, Cambridge.

UNDERWOOD.—On Oct. 8, at Brackley, Northants, John Charles Underwood, MRCS, aged 84.

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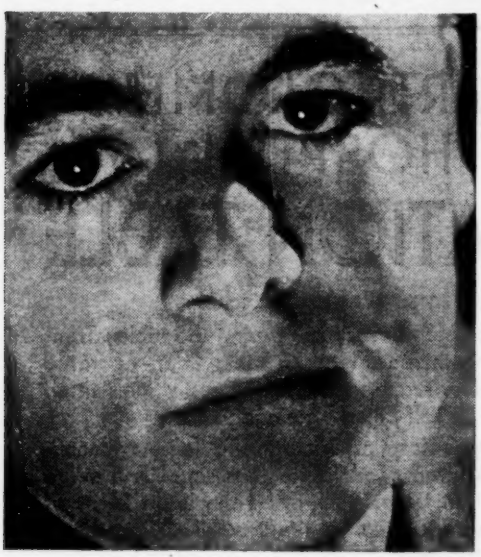

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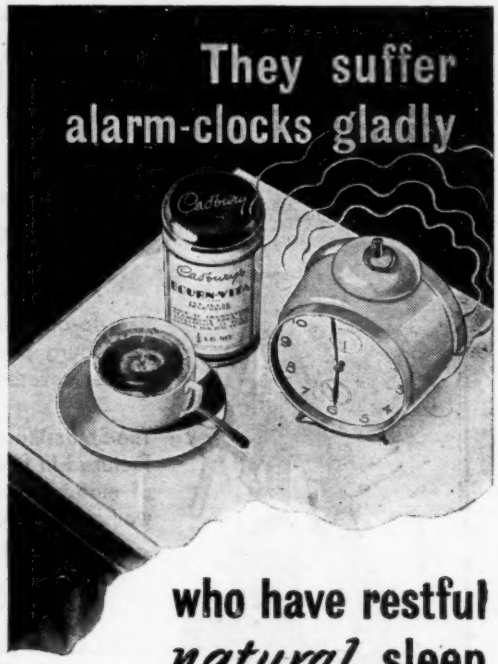

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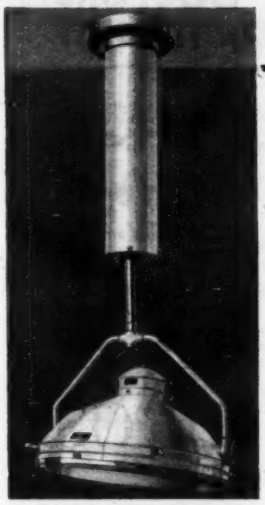

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WAR MEDICINE COURSE
2nd to 6th November, 1942

Monday, 2nd Nov.	10 A.M.	Skin Diseases in War ..	Dr. R. T. Brain, M.D., F.R.C.P.
	11.30 A.M.	Modern Aspects of Army Hygiene.	Major D. L. McLean, R.C.A.M.C.
	1.30 P.M.	Dyspepsia	Dr. C. E. Newman, F.R.C.P.
	3 P.M.	Prescribing in Wartime ..	Dr. P. Hamill, F.R.C.P.
Tuesday, 3rd Nov.	10 A.M.	War Neurosis	Brigadier J. R. Rees, M.D., M.R.C.P.
	11.30 A.M.	War Neurosis (contd.) ..	Brigadier J. R. Rees, M.D., M.R.C.P.
	1.30 P.M.	Salt and Water	Dr. R. A. McCance, M.D., F.R.C.P.
	3 P.M.	Effects of Blast	Mr. S. Zuckerman, M.A., D.Sc.
Wednesday, 4th Nov.	10 A.M.	Medical Aspects of Transfusion.	Dr. Janet Vaughan, D.M., F.R.C.P.
	11.30 A.M.	The Pathology of War Gas Poisoning.	Prof. G. R. Cameron, D.Sc., F.R.C.P.
	1.30 P.M.	Treatment of Gas Casualties	Prof. J. Nixon, C.M.G., M.D., F.R.C.P.
	3 P.M.	Infectious Jaundice ..	Lieut.-Colonel J. E. Gordon, M.C., Ph.D., M.D.
Thursday, 5th Nov.	10 A.M.	Effort Syndrome	Dr. Aubrey Lewis, M.D., F.R.C.P.
	11.30 A.M.	Food Poisoning	Sir Wm. Savage, M.D., L.R.C.P.
	1.30 P.M.	Epidemiology of Paratyphoid Fever.	Sir Wm. Savage, M.D., L.R.C.P.
	3 P.M.	Medical Aspects of Head Injuries.	Major W. R. Russell, M.D., F.R.C.P.
Friday, 6th Nov.	10 A.M.	Crush Injuries	Dr. E. G. Bywaters, M.R.C.P.
	11.30 A.M.	Sulphonamide Drugs in War.	Brigadier L. E. H. Whitby, C.V.O., M.D., F.R.C.P.
	1.30 P.M.	Dietetic Problems	Prof. J. C. Drummond, D.Sc., F.I.C.
	2.30 P.M.	Practical Management of Shock.	Dr. J. McMichael, M.D., F.R.C.P., F.R.S.E.

The fee for the Course will be one guinea, but no fee will be charged in the case of Officers of the Armed Forces who are nominated for the course by their respective Director-Generals. Applications for admission should be addressed to the DEAN, British Postgraduate Medical School, Ducane-road, W.12.

Further War Courses will commence as follows:—

TREATMENT OF FRACTURES (limited to 40)	MONDAY, 23RD NOVEMBER
WAR SURGERY OF THE CHEST	MONDAY, 30TH NOVEMBER
WAR SURGERY OF THE NERVOUS SYSTEM	MONDAY, 14TH DECEMBER

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POSTAL COACHING FOR ALL MEDICAL EXAMINATIONS

MEDICAL PROSPECTUS (36 pages)

sent gratis, along with List of Tutors, &c., on application to the Principal, 17, Red Lion-square, London, W.C.1. (Telephone: HOLborn 6318.)

Examining Surgeons:

FACTORIES ACT, 1937.

The following appointment as Examining Surgeon under the Factories Act, 1937, is vacant.

Applications should be sent to the CHIEF INSPECTOR OF FACTORIES, 28, Broadway, London, S.W.1.

District	*County*	*Latest date for receipt of application*
GRAYS ..	ESSEX ..	27TH OCTOBER, 1942.

The Salvation Army, The Mothers' HOSPITAL, Lower Clapton-road, Clapton, E.5.

Applications are invited from medical Women for the post of JUNIOR RESIDENT MEDICAL OFFICER (A), vacant 1st December, 1942. Salary £80 per annum, with board, residence, and laundry. The appointment is for six months. Practitioners within three months of qualification and liable under the National Service Acts, 1939–41, may also apply.

Applications, with testimonials, to be sent to the Superintendent not later than 31st October, 1942.

FRED HAMMOND, Superintendent.

London Chest Hospital, Victoria Park, E.2.

Vacancy for HOUSE PHYSICIAN (B2) will occur on 1st November, 1942. Six months' appointment. Salary at the rate of £150 per annum, board, residence, and laundry provided. Practitioners qualified more than three months and liable under the National Service Acts, 1939–41 (males must be rejected by the R.A.M.C.), may also apply.

Applications, with copies of three testimonials, should be sent at once to the SECRETARY.

Samaritan Free Hospital for Women, Marylebone-road, London, N.W.1.

Applications are invited from registered Male or Female medical practitioners for the appointment of RESIDENT GYNÆCOLOGICAL REGISTRAR (B1) for a period of six months (renewable), commencing on 15th November, 1942. Salary at the rate of £300 per annum, with board, lodging, and laundry. R practitioners holding A or B2 posts and rejected by the R.A.M.C. may also apply.

Applications should be sent to the Secretary at the Hospital on or before Monday, 26th October, 1942.

G. H. HAWKINS, Secretary.

King George Hospital, Ilford.

Applications are invited from registered medical practitioners, Male and Female, for the appointment of RESIDENT ANÆSTHETIST (B1), vacant on the 1st November, 1942. The salary is at the rate of £350 per annum, with full residential emoluments. R practitioners holding A or B2 posts and rejected by the R.A.M.C. may also apply.

Applications, stating age, qualifications with dates, nationality, and present post, accompanied by three testimonials, should be sent not later than 21st October, 1942, to—

G. AUSTIN HEPWORTH, Secretary and Superintendent.

British Postgraduate Medical School.

(UNIVERSITY OF LONDON.)

Applications are invited from registered medical practitioners, Male and Female, for the appointment of Two HOUSE PHYSICIANS (A), vacant on the 1st November, 1942. The appointment is for six months. The salary is at the rate of £105 per annum, plus full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts, 1939–41, may also apply.

Applications, together with copies of three recent testimonials, should be made to the DEAN, British Postgraduate Medical School, Ducane-road Shepherd's Bush, W.12, not later than Tuesday, 20th October, 1942.

St. Mary's Hospital, W.2.

THIRD ASSISTANT PATHOLOGIST (B1).

Applications are invited for the above post. The appointment is for a period of twelve months (the holder to be eligible for re-election for a second period of twelve months), as from a date to be arranged, at a salary of £350 per annum (for the period of the war). R practitioners holding A or B2 posts and rejected by the R.A.M.C. may also apply.

Applications, stating nationality, date of birth, permanent address, qualifications, and appointments held, together with copies of not more than three testimonials, must reach the undersigned on or before Wednesday, 28th October, 1942.

E. W. STOCKWELL, Secretary.

The South London Hospital for Women, Clapham Common, S.W.4.

Applications are invited from registered medical Female practitioners for the appointment of HOUSE SURGEON (A), vacant on 1st November. The appointment will be for a period of six months. Salary is at the rate of £100 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts, 1939–41, may also apply.

Applications, stating age, nationality, qualifications with dates, and accompanied by copies of three recent testimonials, should be sent to the SECRETARY at the Hospital by the first post on Wednesday, 21st October.

The North Kensington Women's WELFARE CENTRE

(GYNÆCOLOGICAL AND BIRTH CONTROL CLINIC), 12, Telford-road, Ladbroke-grove, W.10.

Applications are invited from Women doctors only for the post of HONORARY CLINIC ASSISTANT at the above Centre. Applications from foreign doctors holding permission to practise in this country would be considered. The work would involve one Birth Control Session weekly, on Friday from 2 to 3.30 P.M.

Applications, accompanied by full particulars and testimonials, should be forwarded to the SUPERINTENDENT at the above address as soon as possible.

Battersea General Hospital, Battersea Park, S.W.11.

The Board of Management invite applications from duly qualified practitioners for the appointment of ANÆSTHETIST on the Honorary Medical Staff of the Hospital. The appointment in the first instance will be for the duration of the war only and the successful candidate will be required to attend for two or three sessions weekly. It is probable that the practitioner appointed will be enrolled in the Emergency Medical Service in connexion with the treatment of air raid casualties and receive remuneration on a sessional basis.

Applications, stating age, nationality, qualifications, and experience, should be sent to the SECRETARY of the Hospital not later than 30th October, 1942.

Wembley Hospital, Wembley, Middx.

Applications are invited for the temporary appointment of PHYSIO-THERAPEUTIST (Male or Female) in charge of the MASSAGE AND ELECTRICAL DEPARTMENT. The remuneration payable is at the rate of £3 3s. per session of one half-day weekly.

Applications should be sent not later than Thursday, 22nd October, 1942, to: P. E. WINDO, Secretary.

10th October, 1942.

The Royal Liverpool United Hospital. ROYAL SOUTHERN HOSPITAL.

Applications are invited from registered medical practitioners, Male or Female, for the B1 appointment of ORTHOPÆDIC AND GENERAL SURGICAL REGISTRAR. Duties to commence immediately. Applicants should have held house appointments and had surgical experience. Preference will be given to candidates holding diploma of F.R.C.S. Salary is at the rate of £200 per annum, with board and residence. R practitioners holding A or B2 posts and rejected by the R.A.M.C. may also apply.

Applications, stating age, nationality, qualifications with experience and details of previous appointments, and (except in the case of students of the Liverpool Medical School) accompanied by copies of three recent testimonials, should be sent not later then Tuesday, 27th October, 1942.

A. V. J. HINDS, Secretary.

The Royal Liverpool United Hospital, 60, Rodney-street, Liverpool, 1, 17th October, 1942.

HIS MAJESTY'S COLONIAL SERVICE

THE COLONIAL MEDICAL SERVICE

VACANCIES FOR MEDICAL OFFICERS

The maintenance of an efficient Colonial Medical Service constitutes a vital part of the national war effort and it is most important that the Service should be assured of an adequate supply of doctors.

The Secretary of State for the Colonies therefore invites applications from doctors possessing a medical qualification registrable in the United Kingdom who are British subjects and who are under thirty-five years of age.

Medical Officers are appointed in the first instance for general service. But there are ample opportunities for work in special branches of medicine and surgery, in public health and in medical research.

The normal salary scale is from £600 to between £1,000 and £1,120. There are large numbers of super-scale posts to which promotion is made on merit and which carry higher salaries.

Government quarters, in many cases free of rent, and first-class passages to and from the Colonies are provided, and an adequate pension scheme is in force.

Selected candidates are normally required to attend a course of instruction in Tropical Medicine and Hygiene either before proceeding overseas or during their first period of leave.

Further particulars, including the regulations governing admission to the Colonial Medical Service, may be obtained from the Director of Recruitment (Colonial Service), 2, Park-street, London, W.1.

Pontypool and District Hospital,
PONTYPOOL, MON.

Applications are invited from registered medical practitioners, Male and Female, for the appointment of RESIDENT MEDICAL OFFICER (B2), vacant on 1st November, 1942. The salary is at the rate of £250 per annum, with full residential emoluments. Practitioners qualified more than three months and liable under the National Service Acts, 1939–41 (males must be rejected by the R.A.M.C.), may also apply when appointment will be limited to six months; otherwise renewable for a further six months subject to satisfactory service.

Applications, stating age, nationality, qualifications, and accompanied by copies of testimonials, to—

N. A. BALL, Secretary.

Royal Manchester Children's Hospital,
PENDLEBURY.

Applications are invited from registered medical practitioners, Male and Female, for the post of ASSISTANT MEDICAL OFFICER (A) at the OUT-PATIENTS' DEPARTMENT, Gartside-street, Manchester. The appointment will be for six months, and the salary is at the rate of £150 per annum. The hours of duty at the Out-patients' Department are from 9 A.M. until 1 P.M., or until the work of the department is finished. Practitioners within three months of qualification and liable under the National Service Acts, 1939–41, may also apply.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of three recent testimonials, should be sent to the undersigned immediately.

By Order,

H. HEARDMAN, General Superintendent and Secretary.

Jenny Lind Hospital for Children,
NORWICH.

Applications are invited from registered medical practitioners, Male and Female, for the appointment of RESIDENT MEDICAL OFFICER (B2). Salary at the rate of £120 per annum, with full residential emoluments. Practitioners qualified more than three months and liable under the National Service Acts, 1939–41 (males must be rejected by the R.A.M.C.), may also apply when appointment will be limited to six months.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of three testimonials, should be sent not later than Wednesday, 28th October, to—

FRANK INCH, Secretary.

Ayrshire Central Hospital.

Applications are invited from registered medical practitioners, Male and Female, for the appointment of SENIOR-ASSISTANT MEDICAL OFFICER (B2), at present vacant. The salary is at the rate of £300 per annum, with full residential emoluments. Practitioners qualified more than three months and liable under the National Service Acts, 1939–41 (males must be rejected by the R.A.M.C. or have obtained the sanction of the Scottish Central Medical War Committee), may also apply when appointment will be limited to six months; otherwise not exceeding twelve months.

Applications, stating age, nationality, qualifications with dates, and present post, and accompanied by copies of three recent testimonials, should be sent to the COUNTY CLERK, County Buildings, Ayr, not later than 2nd November, 1942.

Stockport Infirmary.
(159 Beds.)

Applications are invited from registered medical practitioners (Male and Female) without resident hospital experience for the post of HOUSE PHYSICIAN (A), vacant shortly. Salary £150 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts, 1939–41, may also apply when appointment will be for six months.

Applications, stating age, nationality, qualifications, and experience, and accompanied by three recent testimonials, should be sent not later than 21st October to—

H. G. PRICE, Secretary-Superintendent.

Salisbury General Infirmary.
(Voluntary Hospital—365 Beds.)

Applications are invited from registered medical practitioners, Male and Female, for the appointment of HOUSE PHYSICIAN (B2), vacant on 19th October, 1942. The salary is at the rate of £125 per annum, with full residential emoluments. Practitioners qualified more than three months and liable under the National Service Acts, 1939–41 (males must be rejected by the R.A.M.C.), may also apply when appointment will be limited to six months.

Applications, stating age, nationality, qualifications, and accompanied by copies of testimonials, to—

JOHN WILLIAMS, Superintendent and Secretary.

Salford Royal Hospital.
(256 Beds.)

Applications are invited from registered medical practitioners, Male and Female, for the appointment of HOUSE SURGEON (A) to SPECIAL DEPARTMENTS. Salary at the rate of £150 per annum, with full residential emoluments. The appointment is normally for six months. Practitioners within three months of qualification and liable under the National Service Acts, 1939–41, may also apply.

Applications on the prescribed form should be sent immediately to the undersigned, from whom further particulars and form of application are obtainable.

H. B. SHELSWELL, General Superintendent and Secretary.

October, 1942.

Swansea General and Eye Hospital.

Applications are invited from registered medical practitioners, Male and Female, for the appointments of HOUSE SURGEON (A), vacant early October. Appointments will be for 6 months. Salary is at the rate of £150 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts, 1939–41, may also apply.

Applications, stating age, nationality, qualifications with dates, and accompanied by copies of three recent testimonials, should be forwarded to—

O. C. HOWELLS, Secretary-Superintendent.

Southend-on-Sea General Hospital.

Applications are invited from Male practitioners for the appointment of HOUSE SURGEON (B2). Candidates for Fellowship preferred. Salary at the rate of £150 per annum, with full residential emoluments. Practitioners qualified more than three months and liable under the National Service Acts, 1939–41, may also apply, when appointment will be limited to six months.

The post is now vacant and applications, stating nationality and qualifications, with copies of testimonials, should be sent as soon as possible to—

P. H. CONSTABLE, House Governor and Secretary.

Royal Gwent Hospital, Newport, Mon.
(341 Beds.)

Applications are invited from registered medical practitioners, Male or Female, for the undermentioned appointments:—

(*a*) HOUSE SURGEON (A), vacant now. Salary at the rate of £175 per annum. Practitioners within three months of qualification and liable under the National Service Acts, 1939–41, may also apply when appointment will be for three or six months, according to circumstances.

(*b*) CASUALTY OFFICER (B2), vacant 1st November, 1942. Salary at the rate of £210 per annum. Practitioners qualified more than three months and liable under the National Service Acts, 1939–41 (males must be rejected by the R.A.M.C.), may also apply when appointment will be limited to six months.

Both appointments carry full residential emoluments.

Applications, stating age, nationality, qualifications with dates, and details of previous appointments, accompanied by three recent testimonials, should be sent immediately to—

ALAN RUDDLE, Secretary-Superintendent.

9th October, 1942.

City of Liverpool.

Applications are invited from registered medical practitioners (Male and Female) for the following appointments.

ALDER HEY CHILDREN'S HOSPITAL.

RESIDENT ASSISTANT MEDICAL OFFICER (B2).

Candidates must be fully qualified and registered and should preferably have had previous experience in diseases of children. The salary is at the rate of £200 per annum, with full residential allowances. All fees received in connexion with the appointment to be handed over to the City Council. The position offers exceptional opportunity for anyone wishing to specialise in diseases of children. The appointment will be made in accordance with the Standing Orders of the City Council and will be determinable by one month's notice on either side.

CLEAVER SANATORIUM FOR ADULTS, HESWALL, CHESHIRE.

RESIDENT ASSISTANT MEDICAL OFFICER (B2).

The salary is at the rate of £250 per annum, with full residential allowances. All fees received in connexion with the appointment to be handed over to the City Council.

Practitioners qualified more than three months and liable under the National Service Acts, 1939–41 (males must be rejected by the R.A.M.C.), may also apply when the appointments will be limited to six months; otherwise not exceeding twelve months.

Applications, stating whether R practitioner, age, nationality, qualifications with dates, experience, and details of previous appointments, and accompanied by three recent testimonials, should be endorsed "Resident Medical Officer" and sent not later than 10 A.M., Monday, 26th October, 1942, to—

W. H. BAINES, Town Clerk.

Municipal Buildings, Liverpool, 2, 6th October, 1942.

North Riding of Yorkshire County Council.

ASSISTANT TUBERCULOSIS MEDICAL OFFICER (TEMPORARY).

Applications are invited from registered medical practitioners, exempt or over age for military service, for this appointment. The salary is £600 per annum and rises by two annual increments of £50 to £700 per annum. Travelling allowances will be paid in accordance with the Council's scale. The successful applicant must devote the whole of his time to the duties of the office, must not engage in general practice, and must reside where directed. He will be attached to the County Health Department and subject to the directions of the County Medical Officer. Special knowledge and experience in the modern methods of diagnosis and treatment of tuberculosis, including use of mobile X-ray unit, are essential.

Applications, accompanied by copies of not more than three recent testimonials, and endorsed "Assistant Tuberculosis Medical Officer," must be received by the undersigned not later than Saturday, 24th October, 1942.

HUBERT G. THORNLEY, Clerk of the County Council.

County Hall, Northallerton, Yorks, 9th October, 1942.

Royal Surrey County Hospital, GUILDFORD.

Applications are invited from registered medical practitioners, Male or Female, for the appointment of HOUSE SURGEON (A), now vacant. The appointment is for six months and is recognised for the F.R.C.S. examination. Salary £150 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts, 1939–41, may also apply.

Applications, stating age, qualifications with dates, experience, nationality, and accompanied by testimonials, should be received by the SECRETARY-SUPERINTENDENT not later than 26th October, 1942.

Grimsby and District Hospital.

Applications are invited from registered medical practitioners, Male and Female, for the post of RESIDENT CASUALTY OFFICER AND HOUSE SURGEON (A), duties to commence at once. Appointment for six months. Salary at the rate of £175 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts, 1939–41, may also apply.

Applications, stating age, nationality, qualifications, and copies of recent testimonials, to the SECRETARY-SUPERINTENDENT.

5th October, 1942.

Surrey County Council.

WARREN ROAD HOSPITAL, GUILDFORD.
(General Hospital. 450 Beds.)

Applications are invited from registered medical practitioners, Male and Female, for the appointment of RESIDENT ASSISTANT MEDICAL OFFICER (B1). The position will be available for approximately the further duration of the war, and is subject to one month's notice on either side. Commencing salary according to experience at a point on the grade £350–£25–£450 per annum, plus full residential emoluments. R practitioners holding A or B2 posts and rejected by the R.A.M.C. may also apply.

Applications to the MEDICAL SUPERINTENDENT.

City of Manchester.

BOOTH HALL HOSPITAL. (760 Beds.)

APPOINTMENT OF RESIDENT ASSISTANT MEDICAL OFFICER (A).

Applications are invited from registered medical practitioners (Male or Female) for the above-mentioned appointment, vacant now. The basic salary for the appointment is £200 per annum, with board, residence, and laundry in addition, subject to the Manchester Corporation conditions of service. A temporary cost-of-living wages award is payable in addition to the foregoing salary. Practitioners within three months of qualification and liable under the National Service Acts, 1939–41, may also apply when appointment will be for six months; otherwise not exceeding twelve months.

Full information and forms of application may be obtained from the Medical Officer of Health, Hospitals Administration Section, P.O. Box 399, Town Hall, Manchester, 2, and applications for the post must be received by him not later than 28th October, 1942. Canvassing in any form is prohibited.

R. H. ADCOCK, Town Clerk.

Town Hall, Manchester, 2, 9th October, 1942.

City of Leeds.

PUBLIC HEALTH DEPARTMENT.

ST. JAMES'S HOSPITAL.

RESIDENT OBSTETRIC OFFICER (B1) wanted. Applicants must have had considerable obstetric experience. The duties are principally in the Maternity Department (58 Beds), but work may have to be undertaken at other of the Corporation's hospitals. The officer will work under the direction of the Medical Superintendent and Obstetric Surgeons. Opportunities for gynæcological practice are available. The present salary scale for the post is £400 to £500 per annum with annual increments of £50, subject to satisfactory service. The first increment will take effect on 1st April following the completion of twelve months' service. Board, residence, and laundry are provided, these emoluments being valued for superannuation purposes at £120 per annum. R practitioners holding A or B2 posts and rejected by the R.A.M.C. may also apply.

Applications, stating age, qualifications, &c., together with copies of three recent testimonials, to be forwarded to the undersigned immediately. Canvassing in any form, either directly or indirectly, will be a disqualification.

J. JOHNSTONE JERVIS, Medical Officer of Health.

Public Health Department, 12, Market-buildings, Vicar-lane, Leeds, 1.

City of Leeds.

PUBLIC HEALTH DEPARTMENT.

KILLINGBECK HOSPITAL FOR INFECTIOUS DISEASES.

Applications are invited from registered medical practitioners (Male and Female) for the post of TEMPORARY SENIOR ASSISTANT MEDICAL OFFICER (B1), at present vacant. Candidates should have had experience in infectious diseases. Salary is at the rate of £350 per annum, together with cost-of-living bonus and full residential emoluments. R practitioners now holding A or B2 posts and rejected by the R.A.M.C. may also apply.

Applications should be sent to the ACTING MEDICAL SUPERINTENDENT, Leeds City Hospital, Killingbeck, Leeds.

Ancoats Hospital, Manchester, 4.

Applications are invited from registered medical practitioners, Male or Female, for the appointment of ORTHOPÆDIC HOUSE SURGEON (A), vacant on 31st October. The appointment is for six months. Salary £115 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts, 1939–41, may also apply.

Applications, with copies of three recent testimonials, to be forwarded at once to— HERBERT J. DAFFORNE,

General Superintendent and Secretary.

Leicester Royal Infirmary.

Applications are invited for the post of OBSTETRIC HOUSE SURGEON (A) (Female) to the MATERNITY HOSPITAL, Causeway-lane (52 Beds). The appointment is for six months. Remuneration at the rate of £150 per annum. Practitioners within three months of qualification and liable under the National Service Acts, 1939–41, may also apply.

Applications, with copies of testimonials, to be forwarded to the HOUSE GOVERNOR AND SECRETARY at the Infirmary on or before the 20th October.

8th October, 1942.

East Suffolk and Ipswich Hospital.
(400 Beds.)

Applications are invited from registered medical practitioners for the appointment of HOUSE SURGEON (A) to E.N.T. AND EYE DEPARTMENTS. Appointment will be for period of three months. Salary at the rate of £144 per annum, with full residential emoluments. The Hospital is recognised for the post-graduate study for diplomas of D.L.O. and D.O.M.S. Practitioners within three months of qualification and liable under the National Service Acts, 1939–41, may also apply.

Applications, stating age, nationality, qualifications, and accompanied by copies of testimonials, to—

ARTHUR GRIFFITHS, Secretary.

The Hospital, Ipswich, 17th October, 1942.

The Chester Royal Infirmary.

(Normal Capacity, 225 Beds.)

Applications are invited from registered medical practitioners (Male and Female) for the appointment of HOUSE PHYSICIAN (A) from 1st November. The appointment is for six months and is approved in connexion with the M.D. (London) examination. Salary is at the rate of £150 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts, 1939–41, may also apply.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of three recent testimonials, should be sent not later than the 22nd October, 1942, to DR. W. H. GRACE, Honorary Secretary, Medical Committee.

3rd October, 1942.

Preston and County of Lancaster

ROYAL INFIRMARY.

Applications are invited from registered medical practitioners (Male or Female), preferably those possessing the Diploma in Anæsthetics, for the post of RESIDENT ANÆSTHETIST (B2), vacant on the 31st October. Salary at the rate of £300, with the usual residential allowances. Practitioners qualified more than three months and liable under the National Service Acts, 1939–41 (males must be rejected by the R.A.M.C.), may also apply when appointment will be limited to six months.

Applications, stating age, qualifications, and experience, together with copies of three testimonials, should be forwarded to: JOHN GIBSON, Superintendent and Secretary.

County Borough of Reading.

BATTLE HOSPITAL. (608 Beds.)

RESIDENT ASSISTANT MEDICAL OFFICER (B2) required for general duties, mainly surgical and gynæcological. Salary at the rate of £300 per annum, with full residential emoluments for a single person. Practitioners qualified more than three months and liable under the National Service Acts, 1939–41 (males must be rejected by the R.A.M.C.), may also apply when appointment will be limited to six months; otherwise it is renewable but not to exceed twelve months.

Applications, on forms obtainable from the undersigned, are returnable with copies of three recent testimonials not later than the first post on 26th October, 1942.

C. S. JOHNSON, Town Clerk.

Town Hall, Reading, October, 1942.

Children's Hospital, Nottingham.

Applications are invited for the post of RESIDENT HOUSE SURGEON (B1) (Woman). The salary will be at the rate of £220 per annum, with apartments, board, and laundry. The appointment will be for six months, duties to commence on the 1st December, 1942.

Applications, together with testimonials, stating age, nationality, qualifications, and experience, to be sent to the HONORARY SECRETARY, 1, King John's-chambers, Bridlesmith Gate, Nottingham, on or before Tuesday, 20th October, 1942. Selected candidates will be required to attend at the Hospital for a personal interview.

Burton-on-Trent General Infirmary.

Applications are invited from registered medical practitioners (Male) for the appointment of CASUALTY OFFICER AND HOUSE PHYSICIAN (A). Salary at the rate of £150 per annum, with usual emoluments. Practitioners within three months of qualification and liable under the National Service Acts, 1939–41, may also apply when appointment will be for six months.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of three recent testimonials, to be sent to—

E. W. THORNLEY, Superintendent and Secretary.

Rotherham Hospital.

Applications are invited from registered medical practitioners (Male) for the appointment of a SECOND CASUALTY OFFICER AND HOUSE SURGEON (A) to the OPHTHALMIC AND E.N.T. DEPARTMENTS, vacant now. Salary £200 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts, 1939–41, may also apply when appointment will be for six months.

Applications, stating age, qualifications with dates, and nationality, accompanied by copies of three recent testimonials, should be sent to: T. H. FLETCHER, Secretary-Superintendent.

Horton General Hospital, Banbury.

(220 Beds.)

Applications are invited from registered medical practitioners for the appointment of Two RESIDENT HOUSE SURGEONS. One B2 post for which practitioners qualified more than three months and liable under the National Service Acts 1939–41 (males must be rejected by the R.A.M.C.), may also apply, when appointment will be limited to six months. One A post for which practitioners within three months of qualification and liable under the National Service Acts 1939–41 may also apply, when appointment will be for six months. Salary at the rate of £150 per annum.

Applications to RICHARD H. PRESCOTT, House Governor.

Coventry and Warwickshire Hospital.

Applications are invited from registered medical practitioners, Male and Female, for the following appointments vacant on 1st November:

SENIOR CASUALTY OFFICER (B2) and HOUSE SURGEON (B2). Practitioners qualified more than three months and liable under the National Service Acts, 1939–41 (males must be rejected by the R.A.M.C.), may also apply when appointment will be limited to six months.

HOUSE PHYSICIAN (A). Practitioners within three months of qualification and liable under the National Service Acts, 1939–41, may also apply when appointment will be for six months.

Salary for each appointment is at the rate of £150 per annum, plus £20 cost-of-living bonus, with full residential emoluments.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of three recent testimonials, should be sent immediately to—

S. CECIL HILL, House Governor and Secretary.

Coventry and Warwickshire Hospital.

Applications are invited from registered medical practitioners for the appointment of RESIDENT SURGICAL REGISTRAR (B1), vacant immediately. Applicants should have held house appointments and had surgical experience. Preference will be given to candidates holding diploma of F.R.C.S. Salary is at the rate of £500 per annum, together with full residential emoluments. R practitioners holding A or B2 posts and rejected by the R.A.M.C. may also apply.

Applications, stating age, nationality, qualifications with dates, experience, and details of previous appointments, and accompanied by copies of three recent testimonials, should be sent to the HOUSE GOVERNOR AND SECRETARY, Coventry and Warwickshire Hospital, Coventry.

County Infirmary, Cambridge.

Immediate applications are invited for the appointment of a HOUSE SURGEON (A) (Male or Female) at the County Infirmary, Cambridge, a public assistance institution up-graded as a Class I Hospital. Practitioners within three months of qualification and liable under the National Service Acts, 1939–41, may apply when appointment will be for six months; otherwise for twelve months. The total number of beds available is 262; about 200 beds are occupied at the present time. Salary at the rate of £120 per annum, with board, residence, and laundry.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of recent testimonials, should be sent at once to the CLERK of the Cambridgeshire County Council, Shire Hall, Castle Hill, Cambridge.

Shire Hall, Cambridge, 30th September, 1942.

Norwich City Council.

WOODLANDS HOSPITAL. (311 Beds.)

Applications are invited from registered medical practitioners (Male or Female) for the appointment of ASSISTANT RESIDENT MEDICAL OFFICER (B2), vacant on the 1st December, 1942. The salary is at the rate of £250 per annum, with full residential emoluments. Practitioners qualified more than three months and liable under the National Service Acts, 1939–41 (males must be rejected by the R.A.M.C.), may also apply when appointment will be for six months; otherwise will be renewable for a further period of six months, subject to satisfactory service.

Further particulars of appointment to be obtained from the SENIOR MEDICAL OFFICER, Woodlands Hospital, Bowthorpe-road, Norwich, and to whom applications should be sent.

Surrey County Council.

PUBLIC ASSISTANCE DEPARTMENT.

RICHMOND P.A. INSTITUTION. (350 Beds.)
(Including GROVE ROAD HOSPITAL. (180 Beds.))

Applications are invited from registered medical practitioners, Male and Female, for the appointment of RESIDENT ASSISTANT MEDICAL OFFICER (B1), tenable for the further duration of the war and subject to one month's notice on either side. In addition to the medical treatment of Surrey civilian sick, the Medical Officer will take part in the clinical work of the Emergency Medical Scheme section of the Hospital. Experience in midwifery is desirable. Salary at a point on the scale £350–£25–£450 per annum, according to experience, plus full residential emoluments. R practitioners holding A or B2 posts and rejected by the R.A.M.C. may also apply.

Applications to the COUNTY MEDICAL OFFICER, County Hall, Kingston-upon-Thames, by 20th October, 1942.

The Lawn, Lincoln.

(Registered Hospital for Mental and Nervous Diseases.)

Applications are invited from registered medical practitioners, Male and Female, for an ASSISTANT MEDICAL OFFICER (B2), one with previous mental hospital experience preferred. Salary £300 per annum, with emoluments and war bonus. Practitioners qualified more than three months and liable under the National Service Acts, 1939–41 (males must be rejected by the R.A.M.C.), may also apply when appointment will be limited to six months. Electric Convulsion Therapy is in use.

Apply THE CHAIRMAN OF GOVERNORS, The Lawn, Lincoln.

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Northumberland County Council.

HEXHAM HOSPITAL. (440 Beds.)

Applications are invited from registered medical practitioners, Male and Female, for the appointment of a HOUSE SURGEON (A). Salary is at the rate of £120 per annum, with full residential emoluments. The duties will be largely in connexion with the Orthopædic Centre which is established at the Hospital, but will include general surgical duties. Practitioners within three months of qualification and liable under the National Service Acts, 1939–41, may also apply when appointment will be for six months; otherwise not exceeding twelve months.

Applications, stating age, qualifications with dates, and nationality, accompanied by copies of two recent testimonials, should be sent to: J. B. TILLEY, County Medical Officer.

New Senior School, Mitford-road, Morpeth, Northumberland.

Victoria Hospital, Burnley.

(169 Beds.)

Applications are invited from registered medical practitioners (Male or Female) for the appointment of a HOUSE PHYSICIAN (A), vacant on 17th November, 1942. Salary at the rate of £150 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts, 1939–41, may also apply, when appointment will be for six months; otherwise it may be extended.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of three recent testimonials, should be sent immediately to—

J. E. WHEATCROFT, Secretary.

Manchester Royal Infirmary.

TWO HOUSE PHYSICIANS, SEVEN HOUSE SURGEONS.

The Board of Management of the Manchester Royal Infirmary invites applications from registered medical practitioners, Male and Female, for the above A appointments vacant shortly. Salaries at the rate of £75 per annum, with the usual residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts, 1939–41, may also apply when appointments will be for six months.

Applications, stating age, nationality, and qualifications, to be received by the Chairman of the Medical Board not later than 24th October, 1942. By Order,

F. J. CABLE, General Superintendent and Secretary.

10th October, 1942.

Royal United Hospital, Bath.

Applications are invited from registered medical practitioners (Male) for the appointment of HOUSE PHYSICIAN (A), vacant immediately. Salary £150 per annum, with board, residence, and laundry. Practitioners within three months of qualification and liable under the National Service Acts, 1939–41, may also apply when appointment will be for six months.

Applications, stating age, qualifications, and experience, together with a copy of three testimonials, to reach the undersigned at once.

J. LAWRENCE MEARS, Secretary-Superintendent.

10th October, 1942.

Saint Mary's Hospitals, Manchester 13.

Applications are invited for the post of TEMPORARY MEDICAL OFFICER (from 1st January, 1943, for three months) to the Children's Out-patient Department. Part-time (mornings only).

Applications should be sent stating age, qualifications with dates, nationality and copies of three testimonials to—

9th October, 1942. A. R. WISE, Superintendent.

Doncaster Royal Infirmary.

Applications are invited from registered medical practitioners, Male and Female, for the following appointments:—

CASUALTY OFFICER (A).

HOUSE SURGEON (A).

The appointments will be for six months. Practitioners within three months of qualification and liable under the National Service Acts, 1939–41, may also apply for the above posts.

ORTHOPÆDIC HOUSE SURGEON (B2).

Practitioners qualified more than three months and liable under the National Service Acts, 1939–41 (males must be rejected by the R.A.M.C.), may also apply when appointment will be limited to six months; otherwise not exceeding twelve months.

The salary of each of the appointments is at the rate of £175 per annum, with full residential emoluments.

This large industrial area offers excellent opportunities for gaining experience.

Applications, accompanied by not more than three testimonials, to be sent immediately to—

R. LANCASTER, Secretary-Superintendent.

Applications are invited for the post of

OUT-PATIENTS' MEDICAL OFFICER. Successful candidates will be required to undertake morning work in the Out-patient Department. Applicants must be registered medical practitioners and possess a good knowledge of refraction work. Salary £200 per annum, six mornings per week.

Applications, giving qualifications and age, accompanied by three recent testimonials, should be sent to the GENERAL SUPERINTENDENT, MANCHESTER ROYAL EYE HOSPITAL.

Royal Isle of Wight County Hospital,

RYDE, I.W.

Applications are invited from registered medical practitioners, either sex, for the appointment of a HOUSE SURGEON (B2), now vacant. The appointment will be for six months. Salary at the rate of £180 a year, with board, residence, and laundry. As this is the senior post, previous surgical experience is advisable. Practitioners qualified more than three months and liable under the National Service Acts, 1939–41 (males must be rejected by the R.A.M.C.), may also apply.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of three recent testimonials, should be sent without delay to—

A. S. GORDON, Secretary.

Leeds Public Dispensary and

HOSPITAL.

Applications are invited from registered medical practitioners for the following resident posts:—

Two HOUSE PHYSICIANS (A). Appointment for six months. Salary at the rate of £150 per annum, with residence, board, and laundry. Practitioners within three months of qualification and liable under the National Service Acts, 1939–41, may also apply.

Applications, stating age, nationality, and qualifications, and accompanied by three recent testimonials, to be sent immediately to: CHARLES F. J. MAURY, Secretary and Superintendent.

The Children's Hospital,

SHEFFIELD (INC.). (157 Beds.)

Applications are invited from registered medical practitioners (Male and Female) for the following appointments, now vacant: HOUSE PHYSICIAN (A) and HOUSE SURGEON (A). Salary in each case at the rate of £100 per annum, with full residential emoluments. The successful applicants must be members of a Medical Defence Society. Practitioners within three months of qualification and liable under the National Service Acts, 1939–41, may also apply when the appointments will be for six months.

Applications immediately to—

T. H. G. GARTLAND, Superintendent and Secretary.

Full-time Assistant, Male or Female,

British, for Practice in Wembley. Live out; preferably own car. Good salary to suitable applicant.—Address, No. 924, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

Wanted, Assistant or Partner for

General Practice, country town, North of Scotland.—Address, No. 931, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

Doctor requires Resident Secretary,

Bucks. Salary £150 per annum.—Address, No. 934, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

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with Doctor to develop Cathode Ray Tubes for medical purposes.—Address, No. 933, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

Lady, 32 years of age, wants post,

preferably London, as LABORATORY TECHNICIAN (Clinical) with Doctor. Certificate of London college. Is also experienced secretary and willing to act as receptionist.—Address, No. 929, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

Radiologist, D.M.R.E., ineligible,

Hospital and T.B. experience, desires Appointment.—Address, No. 932, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

Death Vacancy.—Nucleus Consulting

Ear, Nose, and Throat Practice, North Midland city. Good opening for suitable applicant.—Address, No. 930, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

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of Science. Assured market.—Submit to the SCIENTIFIC BOOK CLUB, 121, Charing Cross-road, London, W.C.2.

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